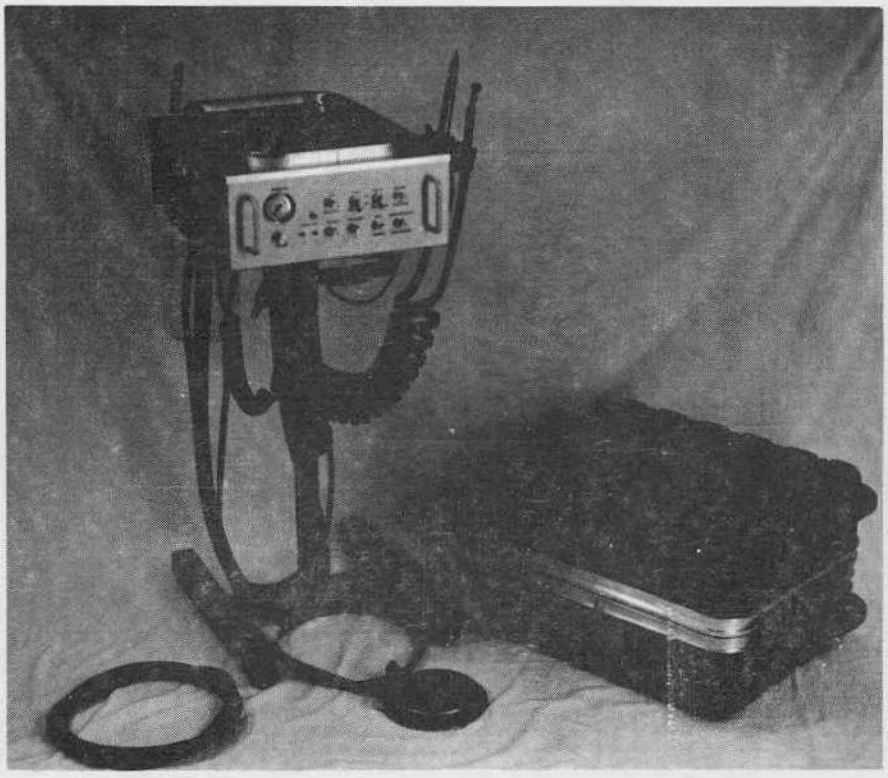
OPERATION AND MAINTENANCE INSTRUCTIONS

FUS336 DENTAL SYSTEM



DEFIANCE ELECTRONICS, INC.

6206 Hwy. 11 East
Lenoir City, TN 37771

NSN 6520-01-333-5961

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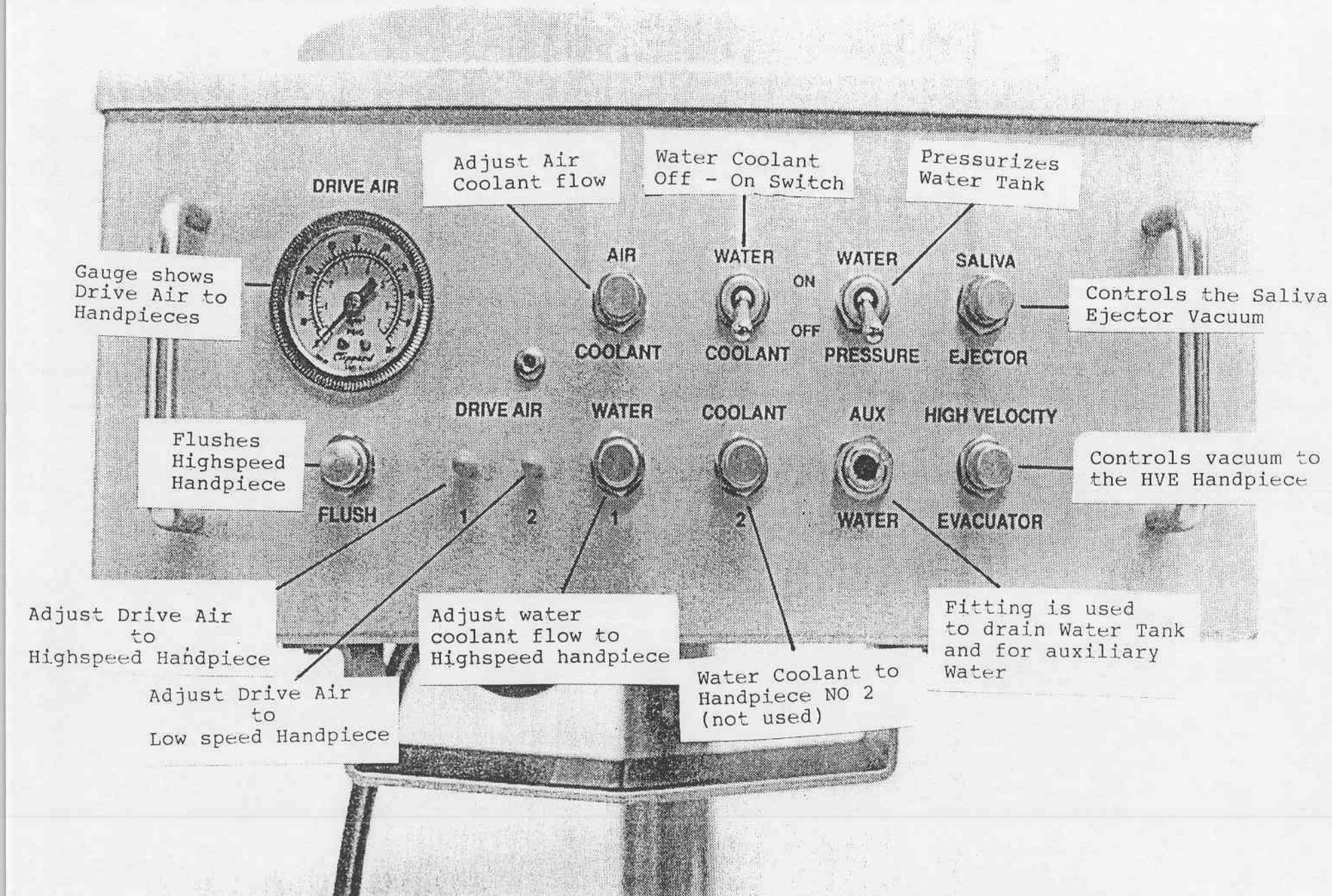
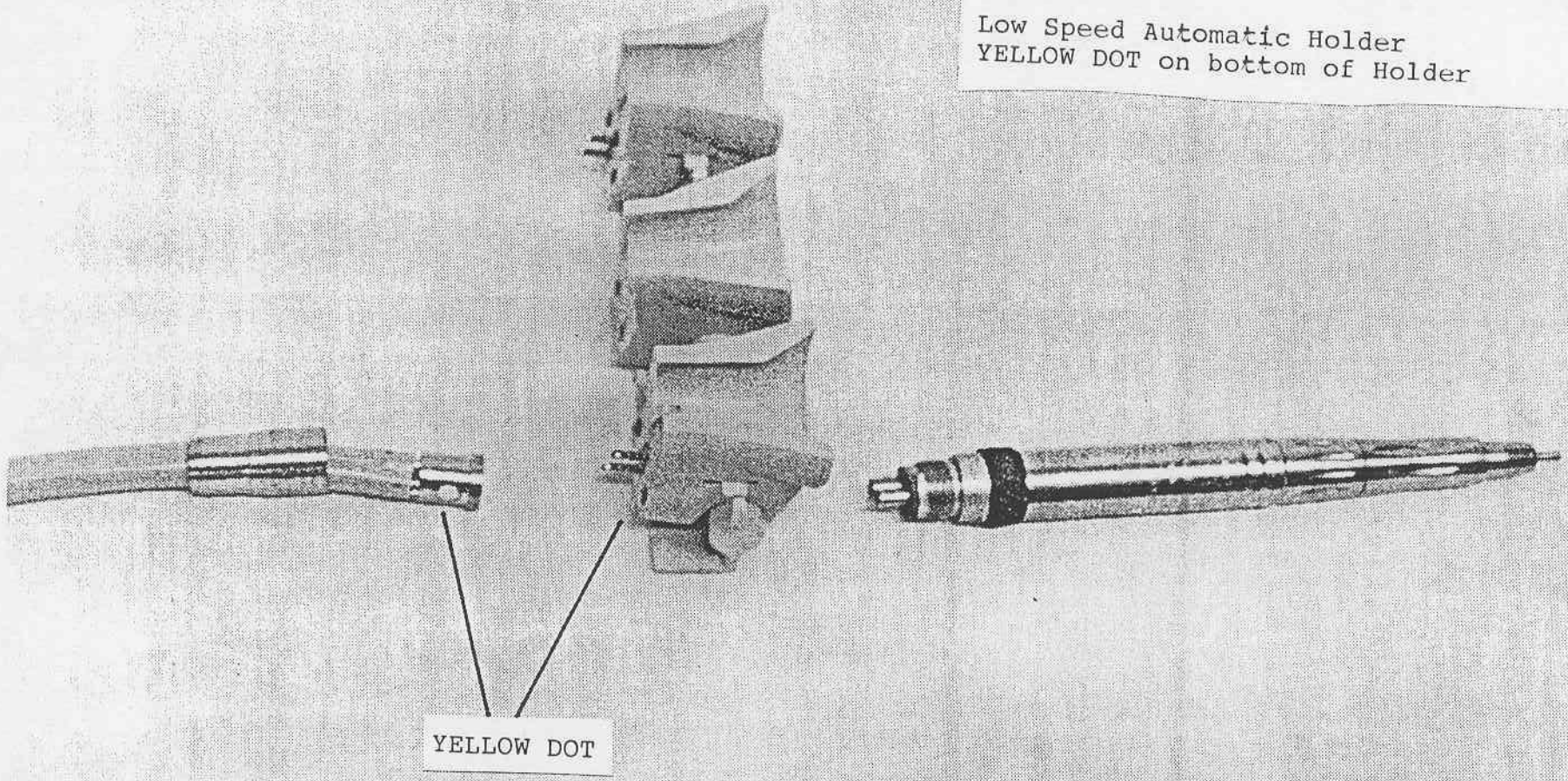
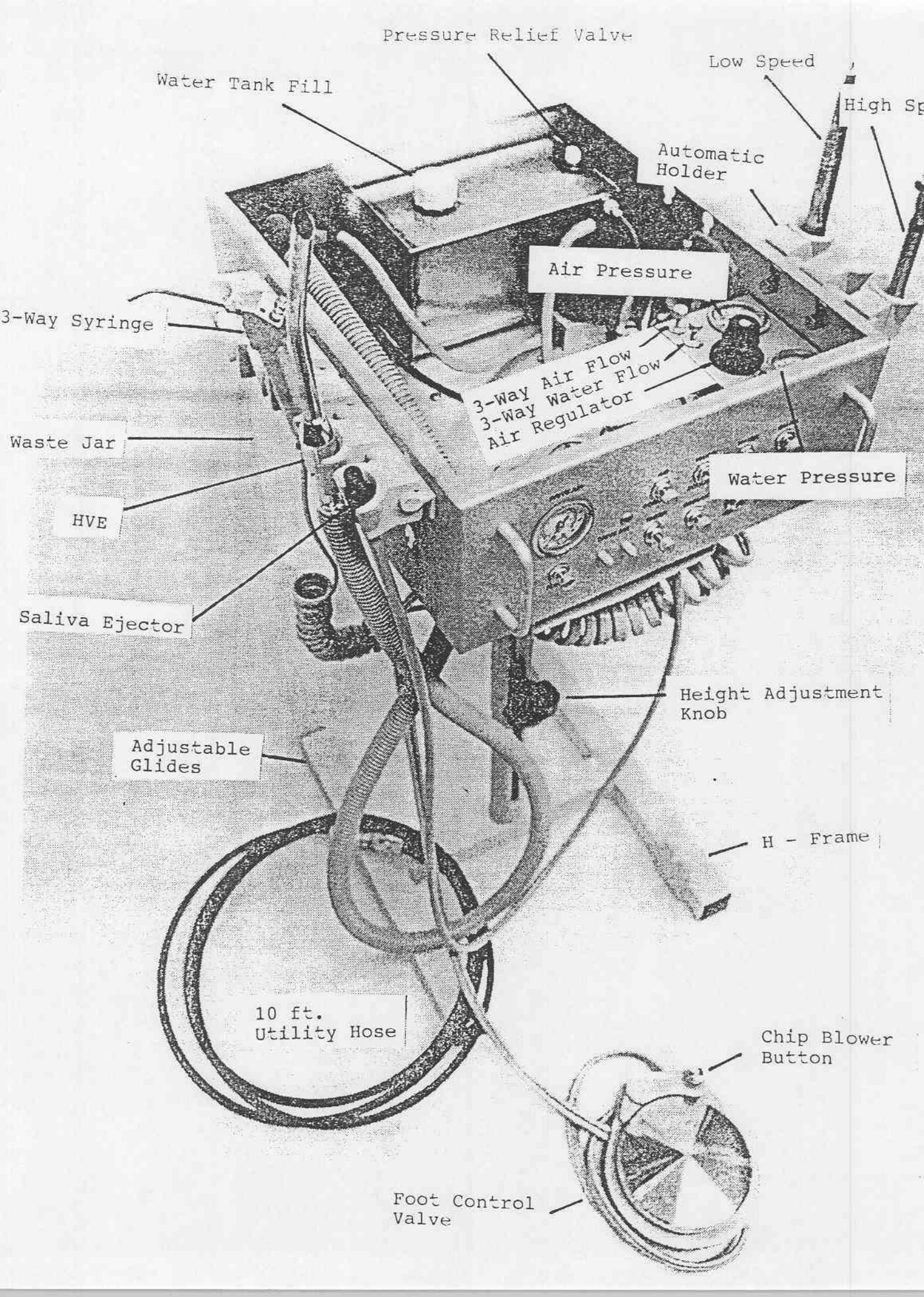

DRIVE AIR
Adjust Air Coolant flow
Water Coolant Off - On Switch
Pressurizes Water Tank
Gauge shows Drive Air to Handpieces
AIR
WATER
WATER
SALIVA
ON
OFF
COOLANT
COOLANT
PRESSURE
EJECTOR
Controls the Saliva Ejector Vacuum
DRIVE AIR
WATER
COOLANT
AUX
HIGH VELOCITY
Flushes Highspeed Handpiece
FLUSH
1
2
1
2
WATER
EVACUATOR
Controls vacuum to the HVE Handpiece
Adjust Drive Air to Highspeed Handpiece
Adjust water coolant flow to Highspeed handpiece
Fitting is used to drain Water Tank and for auxiliary Water
Adjust Drive Air to Low speed Handpiece
Water Coolant to Handpiece NO 2 (not used)

When attaching the Handpieces
to their Coiled Tubing
The following color codes
must be observed

Low Speed Handpiece Tubing
YELLOW DOT

Low Speed Automatic Holder
YELLOW DOT on bottom of Holder




Pressure Relief Valve
Low Speed
Water Tank Fill
High Sp
Automatic Holder
Air Pressure
3-Way Syringe
3-Way Air Flow
3-Way Water Flow
Air Regulator
Waste Jar
Water Pressure
HVE
Saliva Ejector
Height Adjustment Knob
Adjustable Glides
H - Frame
10 ft. Utility Hose
Chip Blower Button
Foot Control Valve

DEFIANCE ELECTRONICS, INC
6206 HWY 11 EAST
LENOIR CITY, TN 37771
615-986-9521

OPERATION AND MAINTENANCE INSTRUCTIONS

FUS336 DENTAL SYSTEM

FEDERAL ITEM IDENTIFICATION
DENTAL OPERATION AND TREATMENT UNIT,
FIELD PORTABLE, AIR OPERATED

NSN: 6520-00-140-7663
6520-01-333-5961

MIL-D-37945A

14 FEB 1991

Defiance warrants its products against defects in material or workmanship for one year from time of sale. Defiance's sole obligation under the warranty is to repair, or at its option, to replace the unit. The buyer shall have no other remedy. (All special, incidental, and coincidental damages are excluded.) Writen notice of breach of warranty must be given to Defiance within the warranty period. The warranty does not cover damage resulting from improper installation and maintenance, accident or misuse.

NO OTHER WARRANTIES AS TO MERCHANTABILITY
OR OTHERWISE ARE MADE.

DEFIANCE ELECTRONICS INC

6206 HWY 11 EAST

LENIOR CITY, TN. 37771

615-986-9521

DEFIANCE ELECTRONICS

FUS 336, PART NUMBER 030657

OPERATION AND MAINTENANCE INSTRUCTION

This Instruction Manual applies exclusively to equipment purchased by the United States Defense Personnel Support Center under National Stock Number 6520-00-140-7663 and 6520-01-333-5961. No other use of this Manual is authorized by Defiance.

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INTRODUCTION

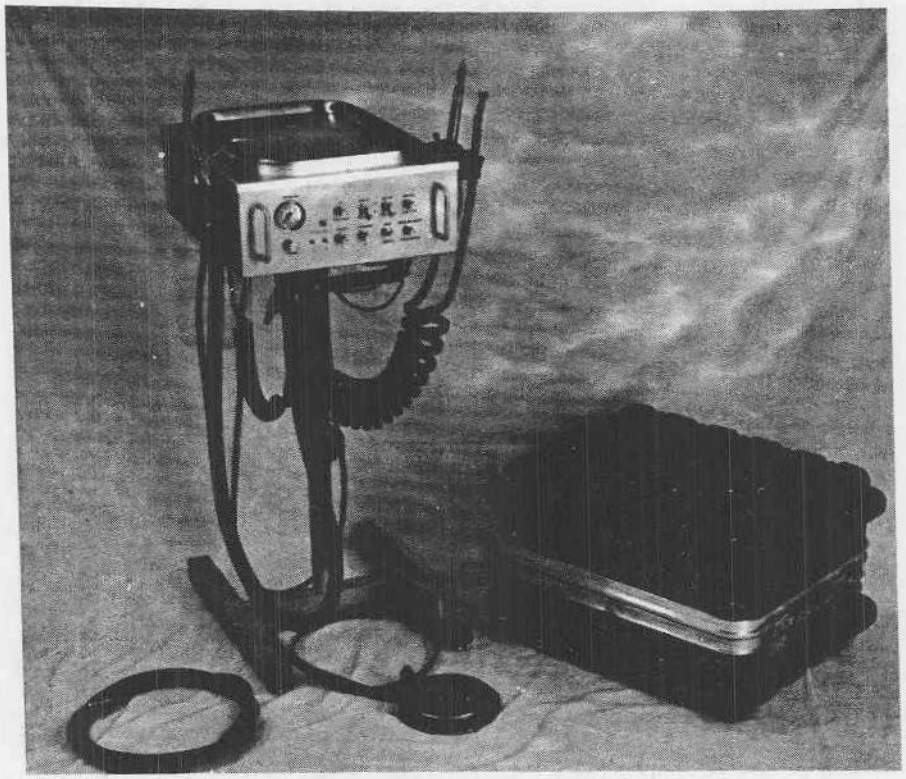
Description of the System

The Defiance Unit (Ill. 1) is a self-contained mobile dental unit designed for field or mobile operatory use.

All facilities required for the practice of general dentistry are provided for both the doctor and the dental assistant. It is built around Defiance 336V009 automatic control system for two handpieces with air and water coolant. Water to the slow speed dry handpiece is blocked off. Oral evacuation is provided by a built-in High Velocity Evacuator and an Air Saliva Ejector (ASE). A pressurized two-quart tank supplies water for handpiece coolant and the syringe.

The only external connection required is the air supply. A ten foot air supply hose is furnished for this purpose. It may be connected to a compressor delivering dry, filtered air at 80-100 psi @ 4 cfm or to bottled gas (carbon dioxide or nitrogen) regulated to 80-100 psi.

The entire unit can be quickly disassembled and packed into the polyethylene carrying case for safe transportation and storage.



ILL. 1

EQUIPMENT FEATURES

Defiance 336V009 Control System for Two Handpieces
Air Coolant Flow Control
Water Coolant On-Off Toggle
Individual Water Coolant Flow Control for each Handpiece
Individual Drive Air Pressure Adjustment for each Handpiece
Drive Air Pressure Gauge
Disc Type Foot Control with Chip Blower Button
Self-Contained Two-Quart Water Tank
Water Pressure On-Off Toggle
Air Vacuum System, including:
- HVE Handpiece Assembly with tubing
- HVE Flow Control
- Air Saliva Ejector with Solids Separator
- ASE Flow Control
- Waste Bottle with Solids Separator (336H005)

3-way Syringe with Coiled Tubing (336I101)
Quick-Disconnect Water Outlet (336F012 and 336A006)
Adjustable Height Frame
Polyethylene Carrying Case (336C101)

ACCESSORIES PROVIDED

Two Coiled Handpiece Tubings with Midwest Connectors (336I105)
10 Foot Air Supply Tubing with Quick Disconnects (336T010)
Stainless Steel Dry Cuspidor (336H012)
Stainless Steel Oral Evacuator Tips 3 ea (336H016)
FUS 336 Accessory Kit
Star Futura High Speed Handpiece (336I102)
Star Futura Low Speed Motor (336I103)
Star Low Speed Nose Cone (336I104)
Remote Adapter (336A009)

For Operation and Maintenance Instructions, refer to the manuals furnished by the handpiece manufacturer.

EQUIPMENT NOT PROVIDED

Air Source, refer to the following: Compressor-Dehydrator for Field Use, NSN 6520-00-139-1264
Umbilical for Connecting to Permanent Utilities
Tray, instrument corrosion resistant steel NSN 6520-00-926-9170.
Consumable:
- Saliva Ejector Mouthpieces, NSN 6520-00-082-2673

PERFORMANCE CHARACTERISTICS

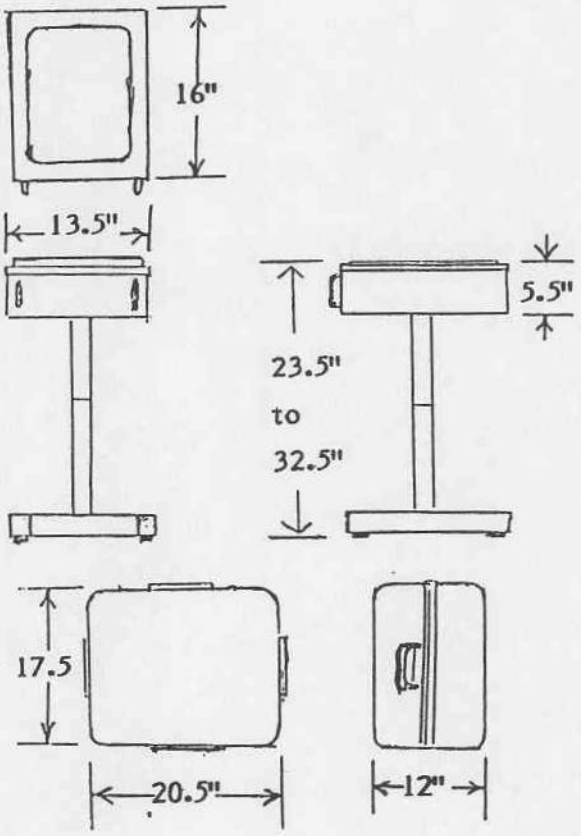
The Defiance FUS 336 performance conforms with the following specifications:

1. High temperature, in compliance with Method 501, Procedure I, MIL-STD-810D.
2. Low temperature, in compliance with method 502, Procedure I, MIL-STD-810D.
3. Vibration, in compliance with method 514, catagory 3, MIL-STD-810D.
4. Shock in compliance with Method 516, Procedure II, MIL-STD 810D.

Water Tank Capacity: 2 Quart (1.89 Liters)
Waste Bottle Capacity: 2 Quarts (1.89 Liters)
Air Supply Requirements: Dry, Filtered Air or Bottled Gas (Nitrogen or CO2), 80-100 psi @ 4 cfm

PHYSICAL SPECIFICATIONS

Height: Adjustable from 23.5 to 32.5 inches
Width: 13.5 inches
Depth: 16 inches
Shipping Weight: 46 lbs. including carrying case
Carrying Case Dimensions; 17.5" x 20.5" x 12"



ILL. 2

PREPARATION FOR USE

1. Be sure the Water Pressure On-Off toggle is turned OFF. Press the vent button on the water tank to ensure that there is no air pressure in the tank. Remove the cap and fill the tank then reinstall the water tank cap.
2. Install the sterilized syringe tip, HVE tip, and saliva ejector mouthpiece.
3. Connect the air supply tubing to a supply of dry, filtered air or bottled gas (nitrogen or CO2) regulated to 80-100 psi.
4. Turn the Water Pressure On-Off toggle ON, then check the air and water pressure gauges. Air pressure should be 60 to 80 psi on the internal panel, and the water pressure should be 40 psi + 5. Instructions for adjusting air and water pressures are in the Maintenance section.

SAFETY PRECAUTIONS

Providing that the instructions given in the manual are followed, the Defiance FUS 336 presents no operations safety hazards, and no special safety precautions are required. Observe the normal precautions associated with the standard dental practices and procedures.

STORAGE DATA

INDOOR STORAGE--Unit may be stored for extended periods (Up to three years) at ambient temperatures of 70 F.

OUTDOOR STORAGE--Outdoor storage is not recommended-Unit is sealed in a vaporproof, air relief valve equipped polyethylene case which will provide protection from the elements, however, long term unprotected storage should be avoided.

TEMPERATURE LIMITATIONS--Short term high 150 F, Low-50 F.

INSTRUCTIONS FOR STORAGE FACILITIES--Unit should be stored at 70 F with low humidity, inspection is required annually. No special packing or preservation is required.

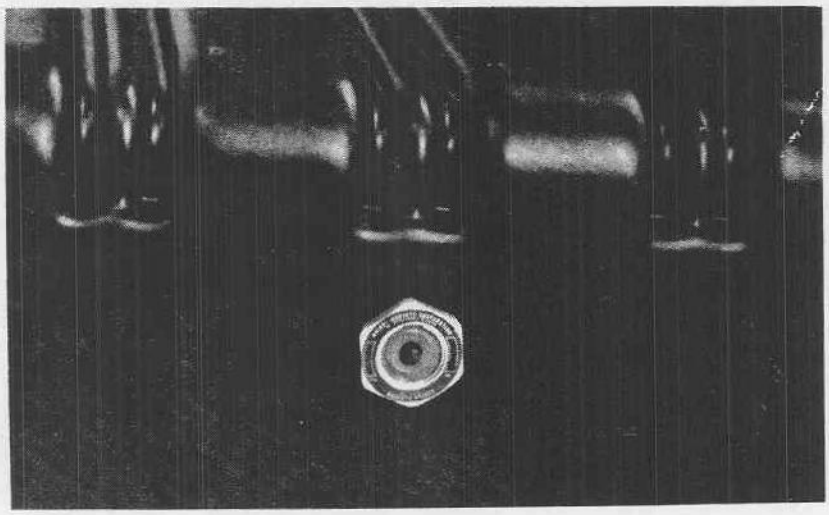
INSPECTION

1. During the assembly of the unit, check for obvious external damage such as cracked carrying case or dented unit.
2. Check the contents of the Accessory Kit against the Accessories Provided.
3. Inspect the handpiece holders for cracks or breakage.
4. Check the frame by adjusting it to several different heights.
5. Check the entire unit carefully for loose or missing hardware.
6. After connecting the FUS 336 to an air supply and filling and pressurizing the water tank, make a thorough inspection for air or water leaks.

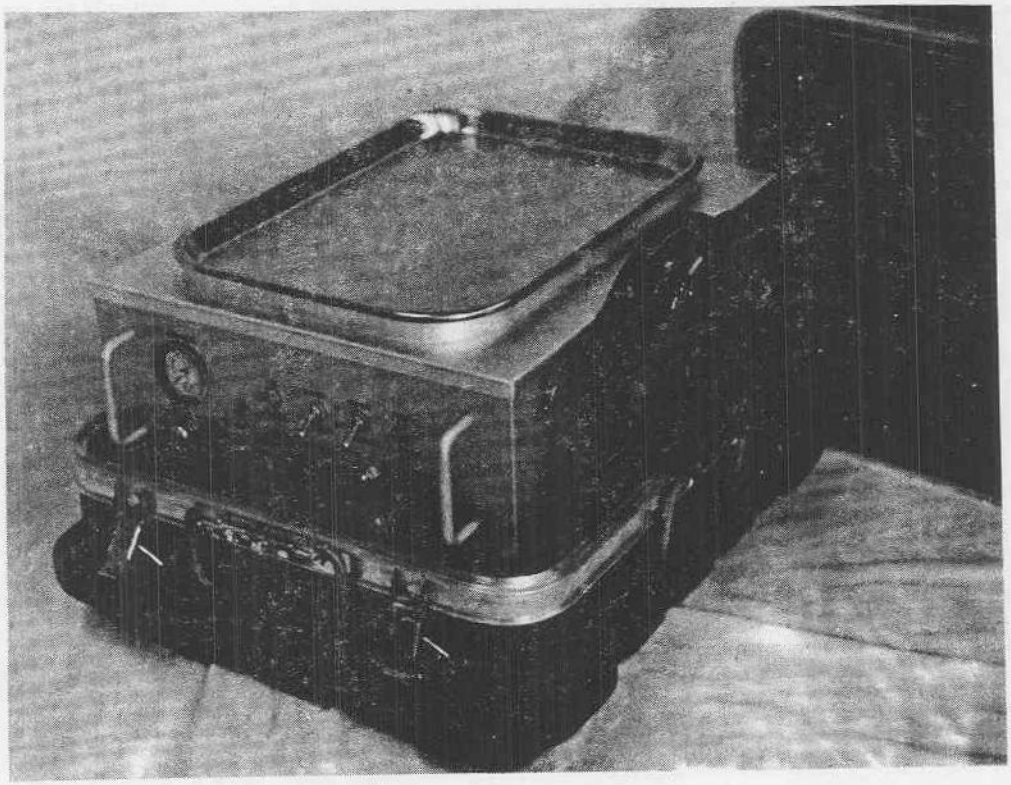
UNPACKING AND ASSEMBLY

1. Push air relief valve button (Ill. 3) on the carry case.

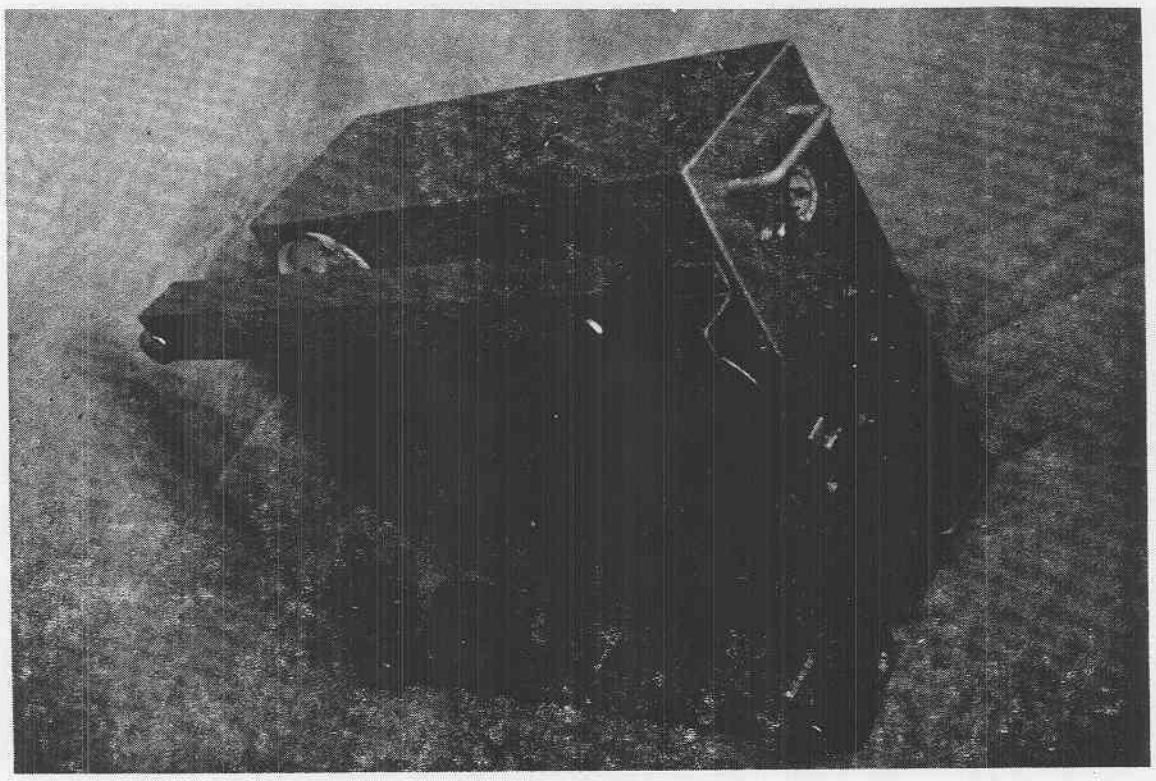
ILL. 3



2. Unlatch the case, and remove the lid and protective foam pad (Ill 4).
3. Lift the unit from the carrying case.
4. Use the Allen wrench from the accessory kit to remove the screw that secures the frame base to the underside of the unit. (Ill. 5)
5. Use the same screw to attach the upright to the frame base.
6. Stand the frame upright and install the unit to the upright. Tighten the thumbscrew.
7. The foot control is stored on the underside of the unit (Ill. 6). Remove it, and carefully draw the foot control tubing from inside the unit.
8. Lift off the top of the Defiance FUS 336. Loosen the thumbscrews that secure the instrument hanger bar assemblies upside down in the unit (Ill.7).
9. Move the hanger bar assemblies to the outside of the unit and install them, as shown in Ill. 8 and 9, or in the alternate holes lower on the side of the unit.
10. Uncoil the saliva ejector and HV Evacuator handpiece tubings, and feed them out through the bottom of the unit. Hang the saliva ejector tip and HV Evacuator handpiece in the hangers, as shown in Ill. 8.
11. Feed the handpiece tubings and syringe out through the bottom of the unit, and place them in the hangers. (ILL. 9)
12. Install the handpiece on their tubings.
13. Install waste screen, screw the HVE waste container onto the bottom of the HVE assembly (Ill. 10).
14. Connect the 10-foot air supply tubing to the quick disconnect on the short supply tubing under the unit. (Ill. 11)



Ill. 4



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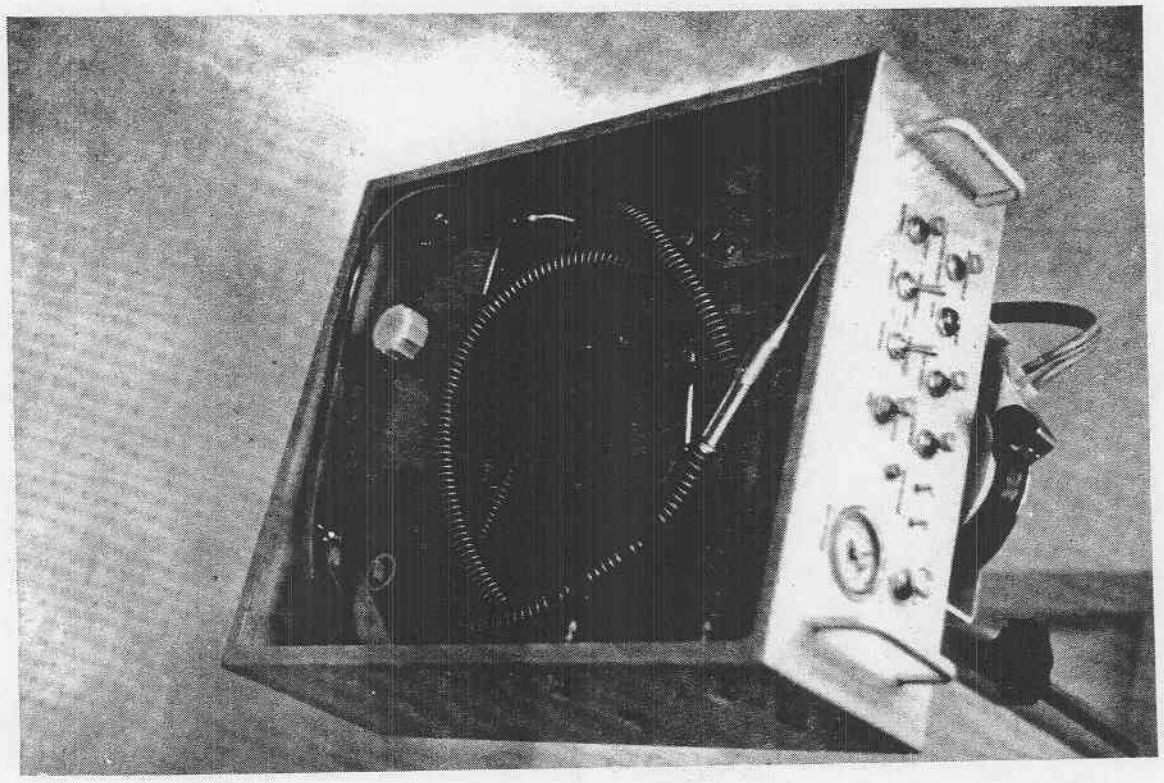
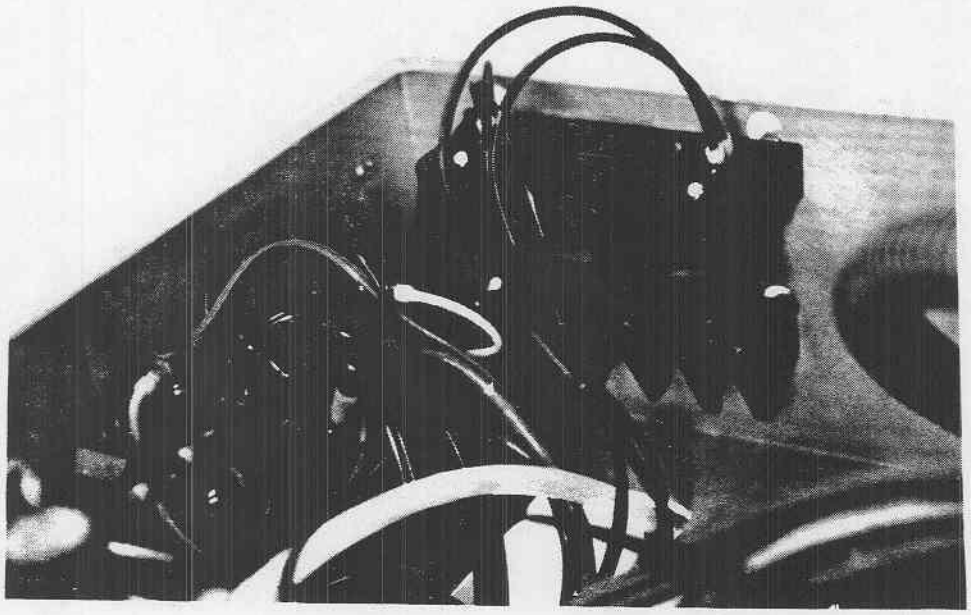


ILL. 6



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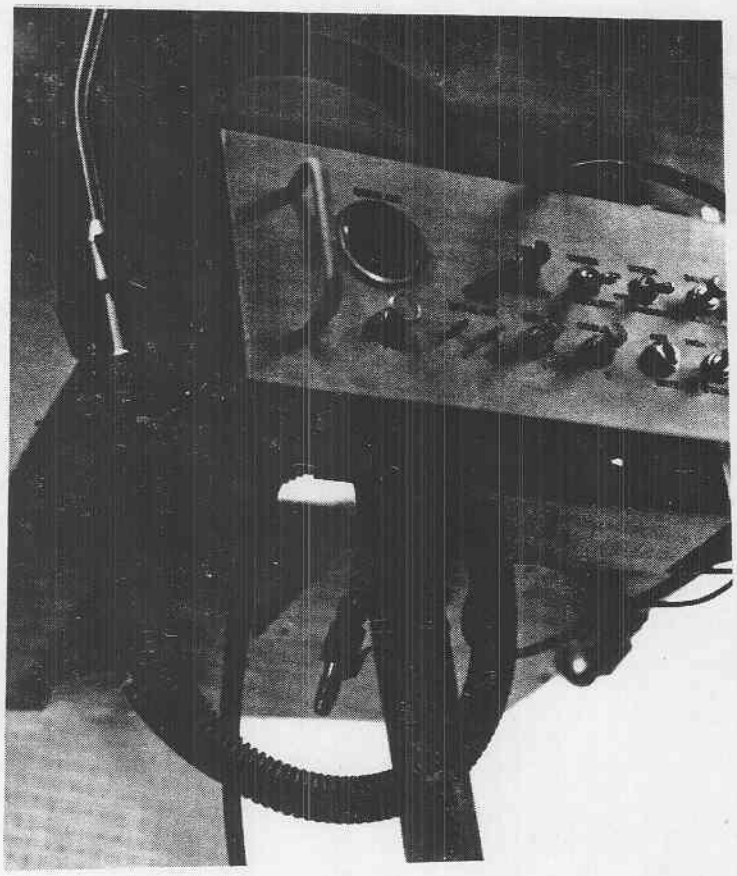

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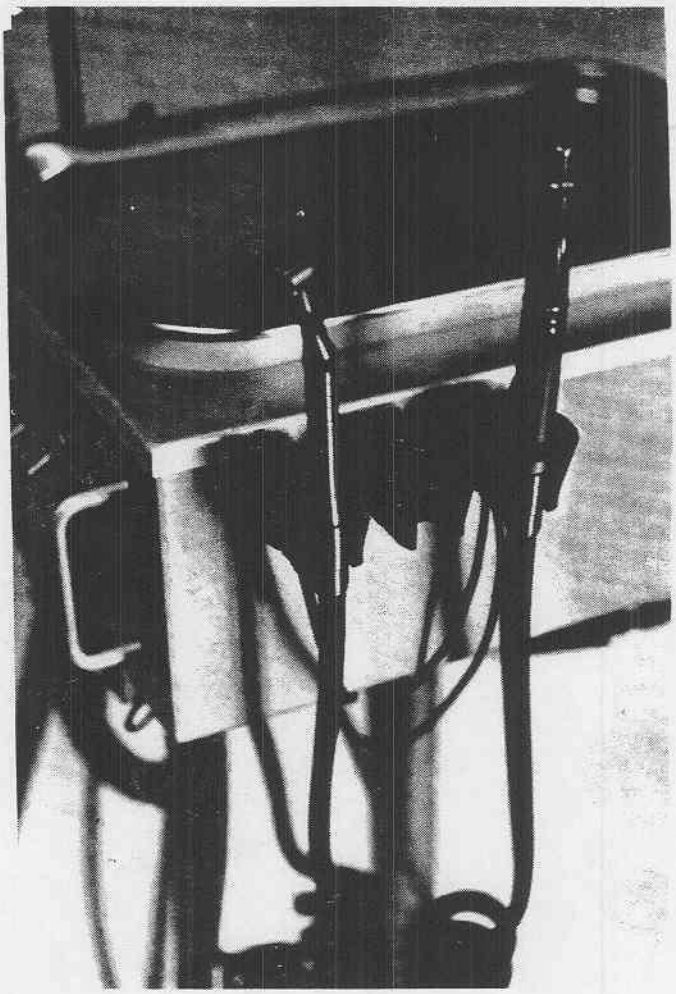

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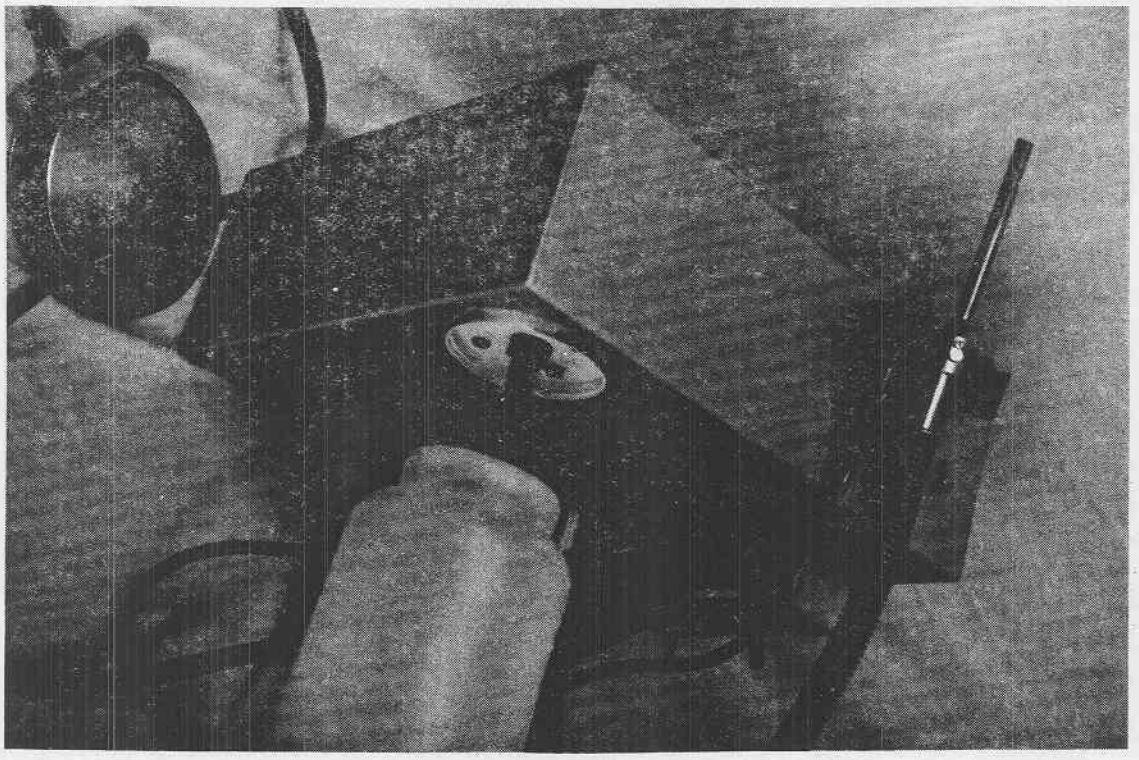
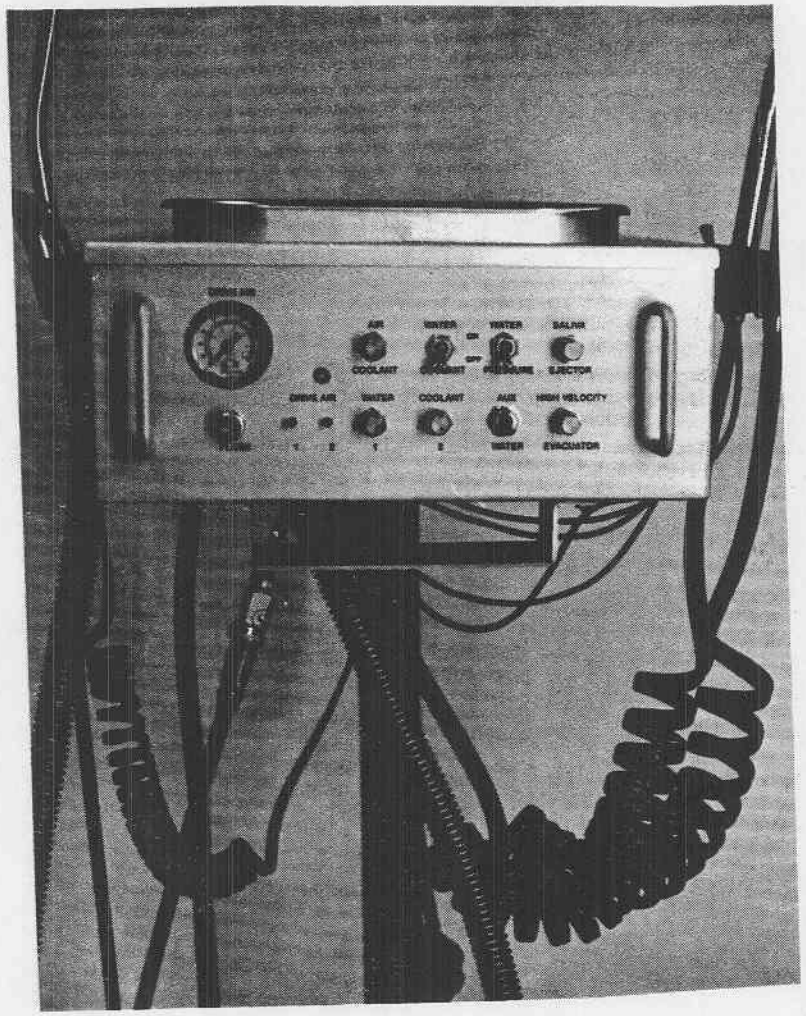


ILL. 10


AIR
COOLANT
WATER
SALIVA
EJECTOR
WATER
COOLANT
AIR
HIGH VELOCITY
EVACUATOR

ILL. 11

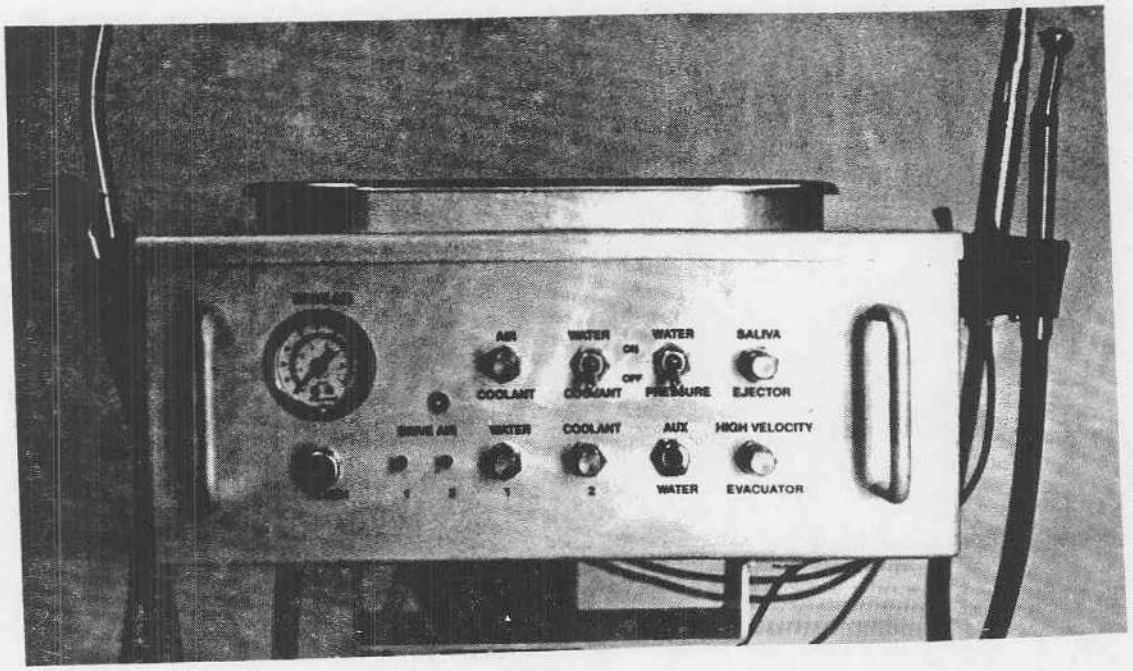
OPERATING INSTRUCTIONS

1. Three way syringe-Air and water adjustment flow is located on the internal panel. Flow should be adjusted to suit the personal preference of the operating professional
2. Adjust HVE Vacuum Control on Front Panel to desired setting. CCW increases vacuum. CW reduces vacuum.
3. Adjust Saliva Ejector Control on Front Panel. CCW increases vacuum, CW reduces vacuum.
4. Remove High Speed Handpiece from automatic holder. Fully depress foot control, adjust air flow to Handpiece. 35 psi maximum, flow control adjustment is on Front Panel.
5. Adjust Air Coolant to High Speed Hand piece by adjusting Flow Control Valve on Front Panel. (Ill. 14)
6. Turn on Water Coolant Toggle.
7. Adjust Water Coolant to High Speed Handpiece by adjusting Flow Control Valve on Front Panel. (Ill. 14)
8. Replace High Speed Handpiece in automatic hanger.
9. Remove Low Speed Handpiece from hanger.
10. Fully depress Foot Control.
11. Adjust drive air pressure to 35 psig using drive air adjustment screw on Front Panel. (Ill. 14)

NOTE: AUTOMATIC HANDPIECE HOLDER SELECTOR SWITCH MUST BE IN THE PROPER POSITION.

OPERATING UNDER ADVERSE CONDITIONS

1. Operation under emergency, adverse or abnormal conditions are not recommended



ILL. 12

SYSTEM SHUT-DOWN

The following steps should be taken when the unit is being shut down for any period in excess of eight hours.

1. Turn the Water Pressure On-Off toggle OFF. Exhaust air from tank by pressing Pressure Relief Valve on top of water tank. Insert the quick-disconnect fitting from the Unit Accessory Kit into the Water Outlet on the Face Plate.
2. Turn the Water Pressure On-Off toggle ON, and allow the water tank to completely drain through the water outlet; then turn the Water Pressure On-Off toggle OFF, and remove the quick-disconnect fitting.
3. Clean the HVE handpiece and the Air Saliva Ejector by following the Cleaning the Air Vacuum system section.
4. Empty the HVE waste container, then clean and disinfect it.
5. Disconnect the air supply tube, and bleed air pressure from the unit by pressing the syringe air button.
7. Thoroughly clean the external surfaces as specified in the Care of the Unit section.
8. Clean the solids strainers in the Air Vacuum System according to the instructions in the Cleaning the Air Vacuum System.
9. Pack the handpieces in their packaging.

CARE OF THE UNIT

SURFACE CLEANING

All external surfaces of the Unit may be cleaned using a solution of hot water and liquid detergent. Abrasive cleansers and scrubbing pads will damage the finishes, and should never be used. The entire unit should be thoroughly cleaned at least once a day.

SURFACE DISINFECTING

Any external surfaces of the unit that are contacted during use should be carefully wiped down with a disinfectant between patients. It is further recommended that at the beginning of each day the unit is in use, the entire unit be wiped down with disinfectant. Isopropyl Alcohol or equal may be used with no danger of damaging the surface finishes of the unit. When selecting a disinfectant, consult a full-service dental supply dealer concerning the effectiveness of each product.

CLEANING THE AIR VACUUM SYSTEM

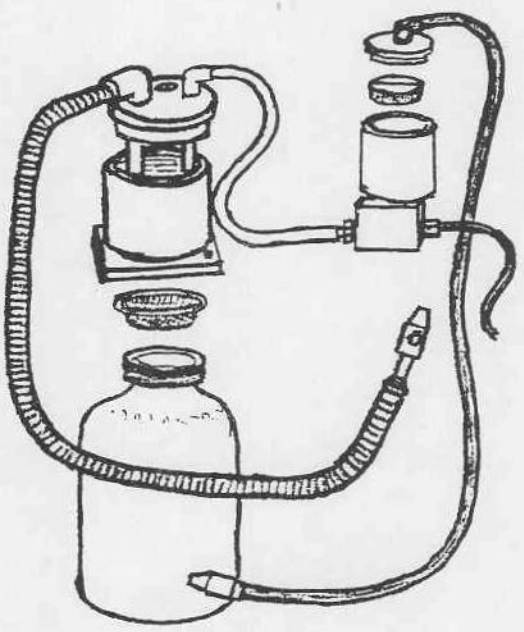
After each patient, the HVE should be thoroughly rinsed by drawing clean water through the HVE handpiece and the saliva ejector. After rinsing, draw air through the system for a few seconds to clear all water from the tubes. Remove the saliva ejector mouthpiece and oral evacuator tip for cleaning and sterilization.
Daily cleaning of the HVE handpiece is necessary to prevent the accumulation of debris. Several special cleaners with disinfectant properties for dental vacuum systems are available from dental supply dealers. If you use one of these cleaners, be sure to follow the manufacturers's recommendations. Never us any sudsing type of detergent for cleaning the HVE.
Use a brush to clean the HVE handpiece. Push the brush all the way past the cross tube to clean the lower portion. Rinse with clean water, then hold the button down until all the water has been purged from the tubing.
The rubber tip on the saliva ejector tubing can be easily removed for cleaning and disinfecting. To reinstall the tip, push and twist until it snaps into place. Do not lubricate the tip.
The air vacuum system and air saliva ejector are quipped with strainers to prevent solids from entering the waste container. These strainers should be cleaned at least once a week.
To clean the ASE strainer lift top from ASE canister. Remove strainer basket.
The AVS waste container should be cleaned and disinfected each time it is emptied.

INSTRUMENT STERILIZATION

Syringe tips, oral evacuator tips, and surgical tips, should be sterilized before use, using the processes recommended below. Before sterilization, all instrument surfaces should be thoroughly cleaned with surgical soap.

SYRINGE TIPS should be sterilized by means of steam autoclave, chemical vapor, dry heat, or ethylene oxide gas processes.

STAINLESS STEEL ORAL EVACUATOR TIPS may be subjected to the same hot sterilization processes recommended for the syringe tip.



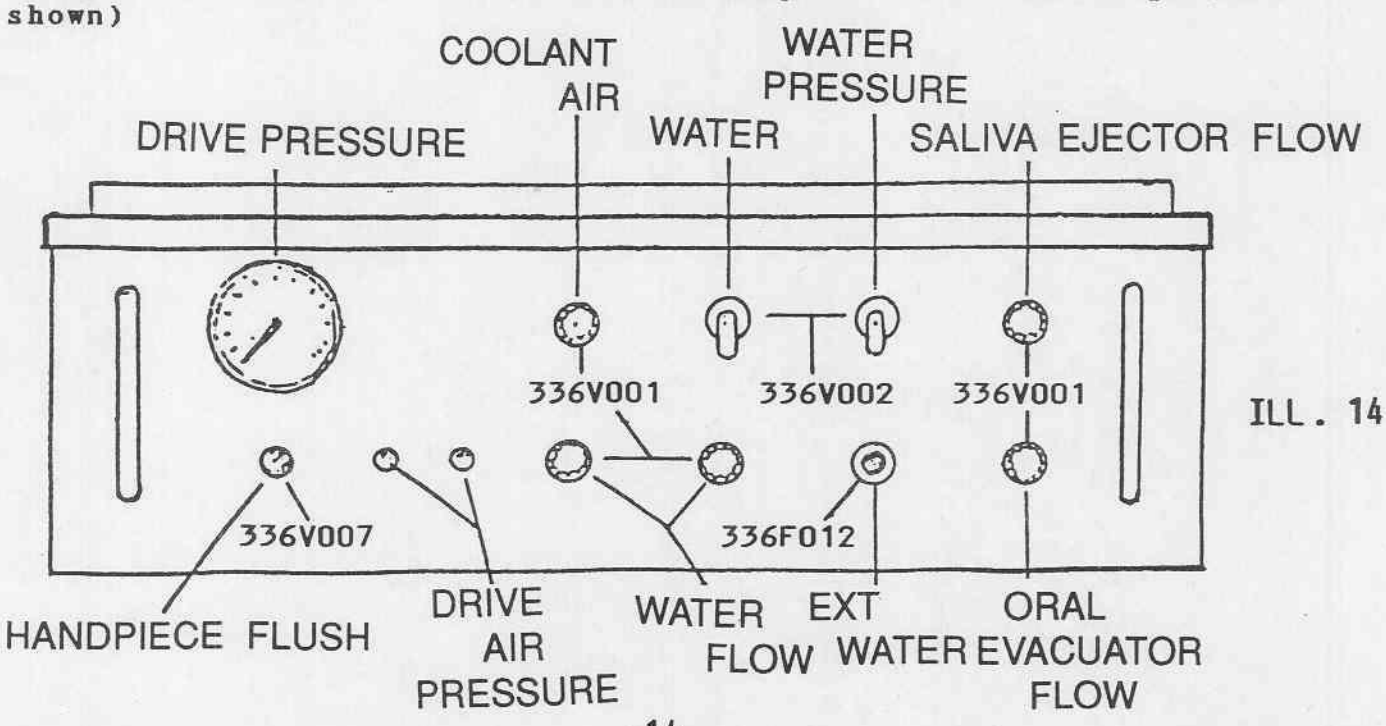
ILL. 13

PACKING THE UNIT

1. Remove the syringe and handpiece tubing from their hangers and feed them back through the bottom of the unit. Lay them along the sides, as shown in Ill 6.
2. Pull the HVE oval evacuator and air saliva ejector tubings back into the unit, and coil them.
3. Loosen the thumbscrews that secure the instrument hanger bar assemblies to the unit. Lift them from their slots, and reinstall them upside-down inside the unit (Ill. 7).
4. Feed the foot control tubing up into the unit, then push the foot control into its hanger to secure. (Ill .6)
5. Loosen the thumbscrew that secures the unit to the upright. Lift the unit from the upright.
6. If the casters are installed on the frame base, remove them and reinstall the foot pads. Pack the casters into the accessory kit bag.
7. Use the Allen wrench from the accessory kit to remove the capscrew that secures the upright to the frame base.
8. Use the same screw to secure the frame base to the underside of the unit (Ill. 5).
9. Pack the accessory kit items into their bag, then attach the upright to the frame base using the upright adjustment knob to secure. Place waste container into carrying case. Place accessory kit in unit. Lower unit into carrying case, coil 10 foot air supply hose and place beside unit. (Ill.4)
10. Place the instruction manual in the tray on top of the unit. Place the foam pad over the unit (Ill. 4) then install the cover on the case.

CONTROL FUNCTIONS

AIR COOLANT FLOW CONTROL adjust the flow of air coolant to the handpieces. Control turned fully clockwise completely shuts off the coolant.
WATER COOLANT ON-OFF TOGGLE (or wet-dry toggle) is used for manually cutting off the flow of water coolant to the hand pieces. Low speed handpiece coolant is mechanically blocked.
WATER COOLANT FLOW CONTROLS independently adjust the flow of water coolant to each of the handpieces.
AUTOMATIC HANDPIECE HOLDER activates the handpiece. When a handpiece is lifted from its holder, a valve inside the holder allows drive air and coolant to reach the handpiece.
HANDPIECE LOCK-OUT TOGGLE overrides the automatic handpiece control function. It is used to "lock-out" a handpiece when two handpieces are out of their holders at the same time.
WATER PRESSURE ON-OFF TOGGLE is used to pressurized the water tank.
WATER OUTLET is provided for connecting accessories to the self-contained water supply. The outlet is a standard quarter-inch female quick-disconnect. This fitting can also be used to connect the unit to an external water source.
ORAL EVACUATOR FLOW CONTROL adjusts the vacuum generated in the HVE handpiece. Turn the knob clockwise to decrease vacuum, or counter-clockwise to increase vacuum.
SALIVA EJECTOR CONTROL adjusts the amount of suction generated in the air saliva ejector. Turn the knob clockwise to decrease suction and shut off the ASE; or counter-clockwise to turn the ASE on and increase suction.
FOOT CONTROL VALVE controls the handpiece speed, and provides an air signal for the air and water coolant.
CHIP BLOWER BUTTON on the foot control provides a jet of air from the handpiece air coolant tube when the handpiece is not running. (not shown)



ILL. 14

MAINTENANCE

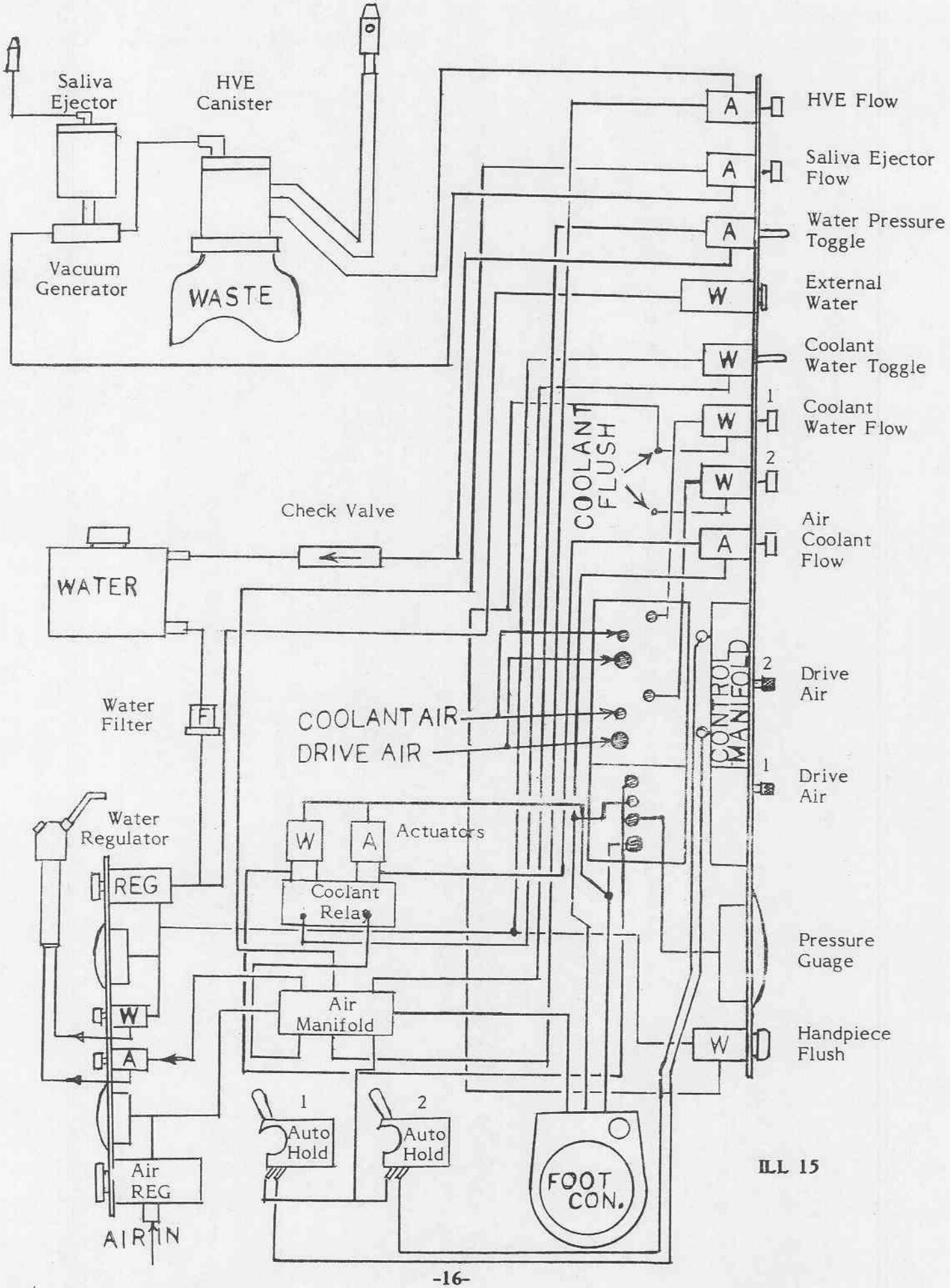
BASIC TROUBLESHOOTING

Given proper care, your unit will provide years of reliable service. In the event that something does go wrong with the unit, this troubleshooting guide tells what can be done in the operatory, before removing the unit for repair.
This troubleshooting guide is not intended to isolate every problem that could arise. Rather it is designed so that you can quickly identify the problems that can be repaired without special training or equipment.
If the procedures given here do not identify and correct the problem, much more detailed instructions are given in the sections covering the individual components of the system.

NEITHER OF THE HANDPIECES WORK (NO AIR OR WATER)
1. Does the syringe work? YES: Check for a pinched or crimped foot control tubing. If the tubing is okay, refer to the Foot Control. NO: Proceed to Step 2.
2. Is the air supply (compressor or bottled gas system) turned ON and operating properly? YES: Proceed to Step 3. NO: Correct any problems in the air supply, then re-test the unit.
3. Is the air supply tubing properly connected? YES: Refer to the Regulators. NO: Connect the air supply tubing, and re-test the unit.

NO WATER COOLANT FROM EITHER HANDPIECE
1. Test the syringe. Does it spray water? YES: Proceed with step 2 NO: Verify that there is water in the tank and that the water pressure On-Off toggle is turned On.
2. Verify handpiece is attached to the correct hose.
3. Check the controls. Is the Water coolant On-Off toggle ON? Are the water coolant flow controls open? YES: Proceed with Step 3. NO: Set the controls as specified and retest the unit.
4. Does the handpiece air coolant work? YES: Refer to the Control Block Section. NO: Refer to the Signal Relay.

INSUFFICIENT DRIVE AIR PRESSURE
1. Does the problems affect both handpieces? YES: Proceed to Step 2. NO: Refer to the drive air pressure adjusting procedure in the Routine Adjustments section.
2. Check the system air pressure gauge. Does it show a pressure of at least 60 psi? YES: Proceed to Step 3. NO: Refer to the Regulators section.
3. Watch the system air pressure gauge while pressing the syringe air button. Does the pressure drop by more than 15 psi? YES: Check incoming air supply for proper flow. NO: Refer to the Foot Control section.


Saliva Ejector
HVE Canister
Vacuum Generator
WASTE
HVE Flow
Saliva Ejector Flow
Water Pressure Toggle
External Water
Coolant Water Toggle
Coolant Water Flow
COOLANT FLUSH
Check Valve
Air Coolant Flow
WATER
Water Filter
COOLANT AIR
DRIVE AIR
CONTROL MANIFOLD
Drive Air
Drive Air
Water Regulator
Actuators
REG
Coolant Relay
Pressure Guage
Air Manifold
Handpiece Flush
Auto Hold
Auto Hold
FOOT CON.
Air REG
AIR IN

ILL 15

PRESSURE ADJUSTMENT
The regulated air and water pressures are indicated on the gauges inside the unit. Air pressure should be 60 to 80 psi, and water pressure should be 40 psi + 5 psi.
Before adjusting the air or water regulators, verify that the air supply tube is connected to an 80-100 psi source. Do not attempt to adjust the air regulator if supply pressure is less than 80 psi. Be sure there is water in the tank or that the water supply tube is connected to an external water source.
If adjustment of either the air or water pressure is required, turn the regulator knob clockwise to increase pressure or counter clockwise to decrease pressure. It is necessary to relieve the pressure in the system before reading the gauge. Do this by pressing the syringe buttons.

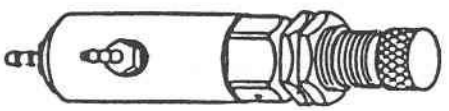
SERVICING THE AIR REGULATOR (Ill. 17)
The air regulator 336V010 used in the unit is subject to only two types of problems; (1) External leakage; and (2) internal leakage.
External Leakage. In the event of external leakage from the air regulator, take the following action according to the point of leakage:

1. Leakage around the top of the regulator results from a loose cover or a defective piston assembly. If tightening the cover does not stop the leak, replace the piston.

Internal Leakage. If the air pressure gauge indicates that the pressure creeps upward when the unit is not being used, there is air leaking past the inlet seal. This can normally be corrected by replacing the piston. When installing the new piston, be certain that there is no foreign material on the sealing surfaces in the valve body.

SERVICING THE WATER REGULATOR
The Water Regulator is basically a non-repairable component. External leakage around the inlet or outlet can be corrected by tightening the fitting. Leakage around the adjusting knob or erratic water pressure are indications of internal leakage. Install a new regulator.

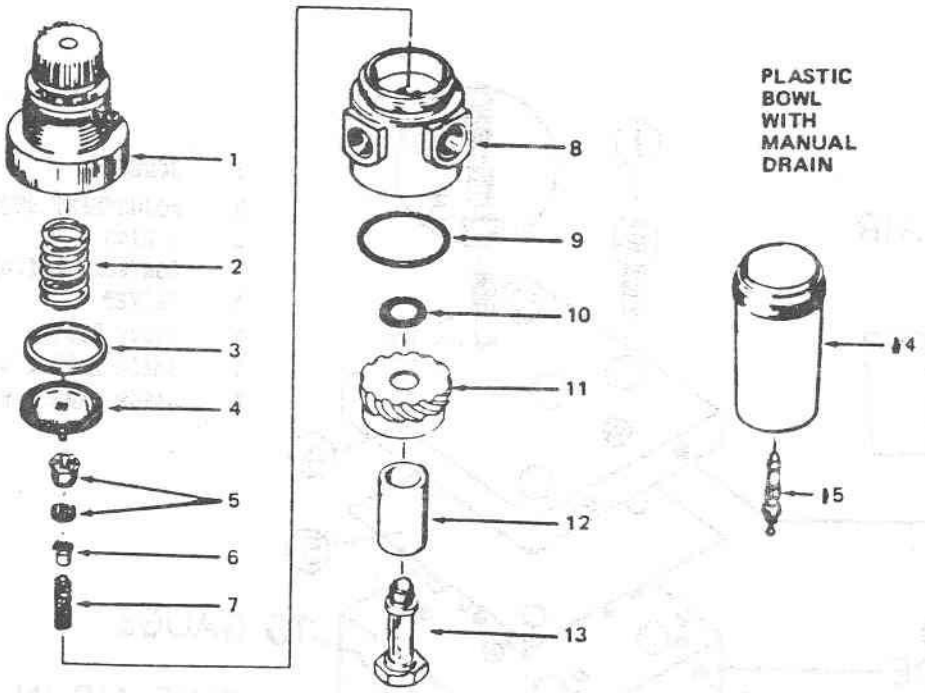
WATER REGULATOR
336V006



ILL. 16

AIR REGULATOR

AIR REGULATOR	336V010-XXX
BONNET	001
REGULATING SPRING	002
SLIP RING	003
DIAPHRAGM	004
VALVE SEAT & GASKET ASSEMBLY	005
VALVE	006
VALVE SPRING	007
BODY	008
O-RING	009
GASKET	010
LOUVER	011
ELEMENT	012
STUD	013
PLASTIC BOWL/MANUAL DRAIN	014
MANUAL DRAIN VALVE	015



ILL. 17

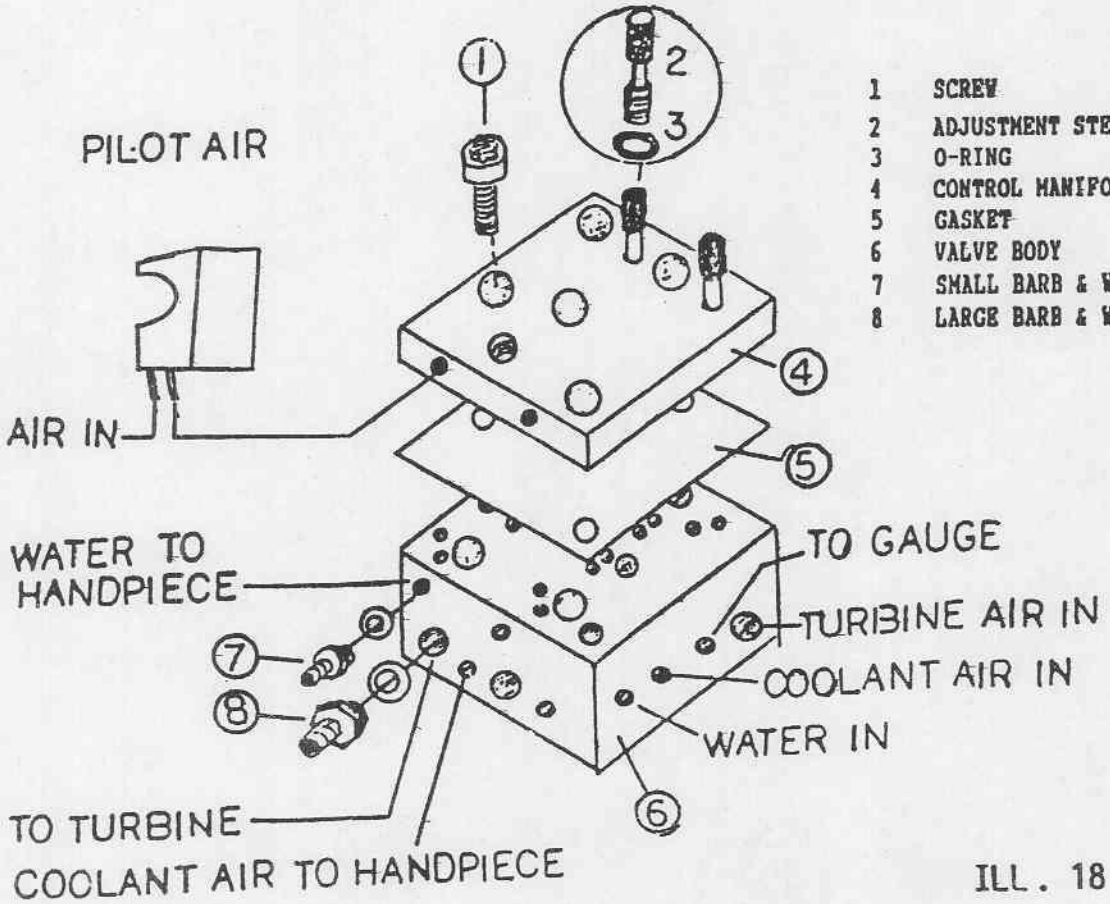
MAIN CONTROL BLOCK

The Defiance FUS 336 Main Control Block automatically permits flow of air coolant, water coolant and drive air to the handpiece if initiated by the proper toggle valves. The Main Control Block also shuts off all flow to one handpiece when the other handpiece is activated as required by MIL-D-37945A 3.3.4.

Air or Water Leaks--Corrective Action
Remove stems from Control Manifold by turning in a clockwise direction, clean "O" rings, lube and replace. Replace Manifold Gasket. Stems and lid gasket are the only moving parts in the Defiance FUS 336 Main Control Block. (Ill.18)

The Control Manifold is sequentially mounted to the Main Control block. (Ill. 18)

MANIFOLD TROUBLESHOOTING--There are only two moving parts in the Manifold; the drive air adjusting screws and the manifold gasket. Refer to the Main Control Block Section.
The Coolant Controls are mounted on the front panel. CCW increases the flow.



1	SCREW	336V009-001
2	ADJUSTMENT STEM	002
3	O-RING	003
4	CONTROL MANIFOLD	004
5	GASKET	005
6	VALVE BODY	006
7	SMALL BARB & WASHER	336P002
8	LARGE BARB & WASHER	336P003

ILL. 18

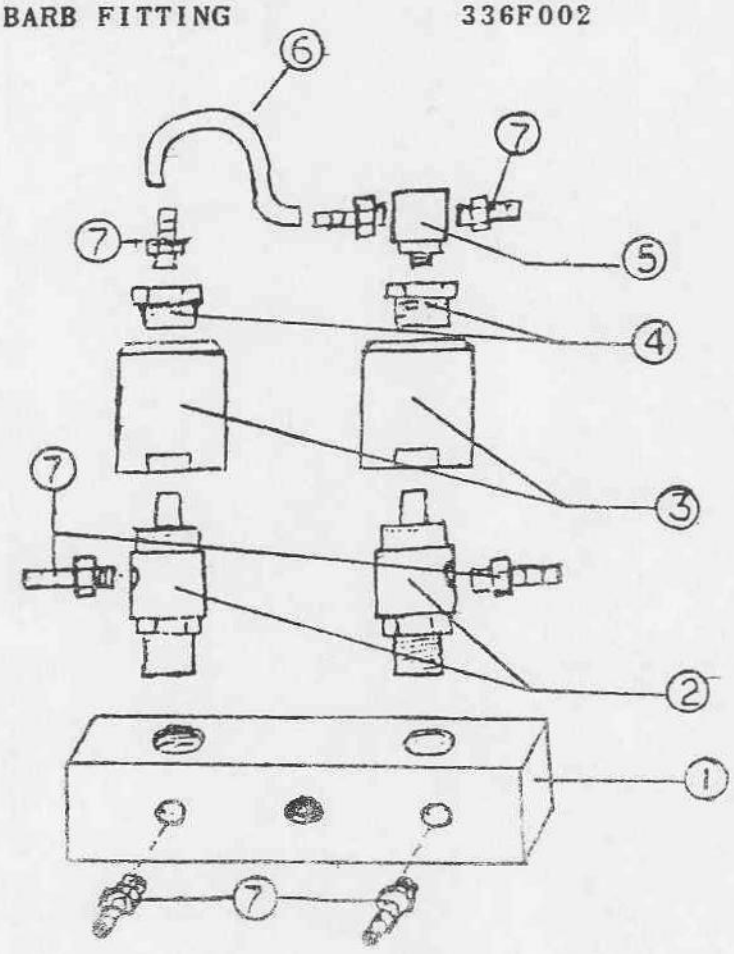
AIR AND WATER COOLANT RELAY--When front panel selector switches are on, relay detects positive pressure from foot control and permits coolant flow thru Main Control Block. Relay activates when drive air reaches 9 psig. (Ill. 19)

AIR AND WATER COOLANT RELAY TROUBLESHOOTING--This is a very simple system consisting of two 2-way poppet valves and two air pressure actuators

If trouble is suspected in this system, the actuator may be manually worked with a short straight rod. This will activate the valve.

MANIFOLD, RELAY

1	COOLANT MANIFOLD	336I002
2	VALVE	336V003
3	ACTUATOR	336V004
4	BUSHING	336F009
5	TEE	336F001
6	TUBE	336T001
7	BARB FITTING	336F002

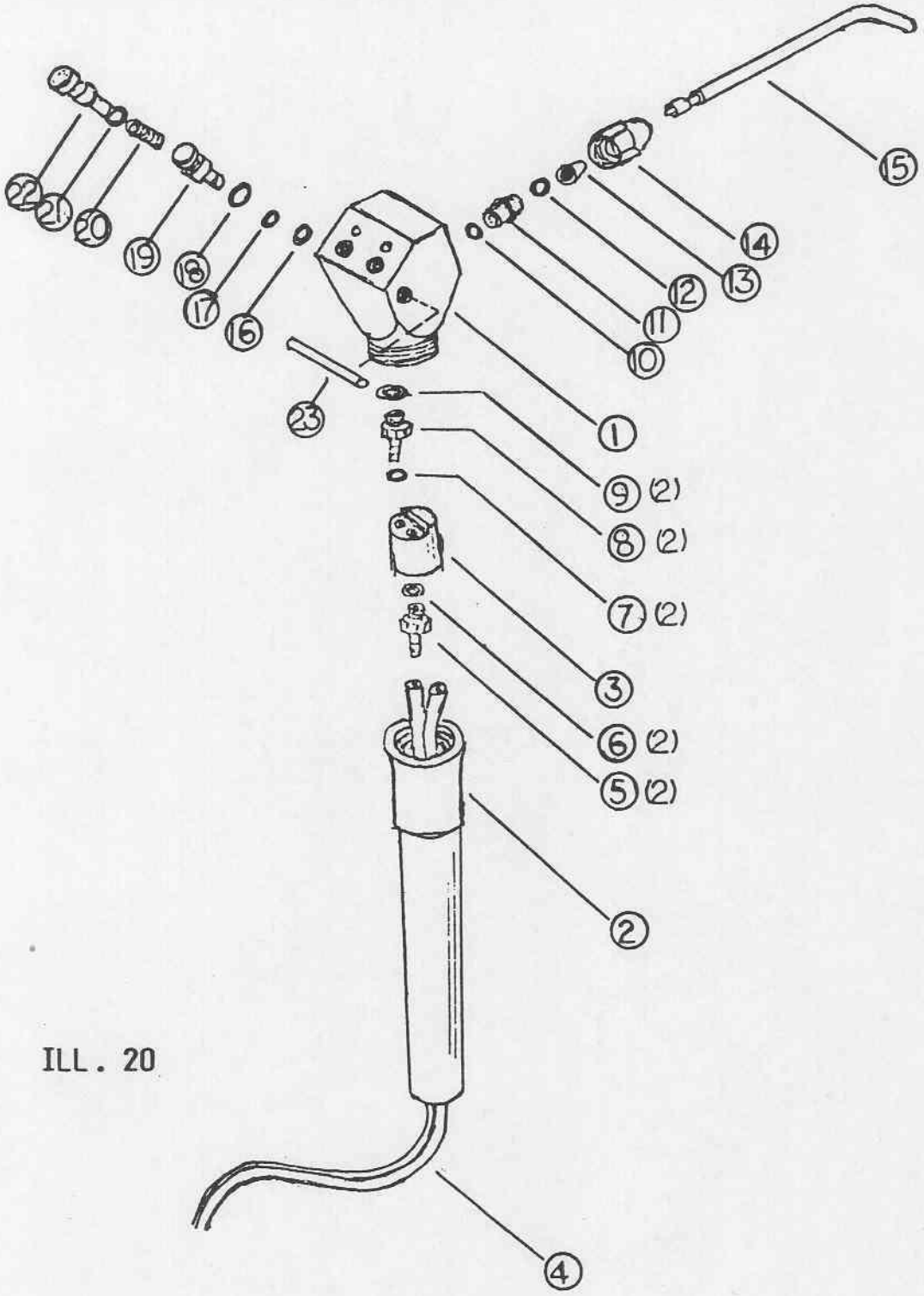


ILL. 19

SYRINGE

The syringe is designed so that it can be easily serviced with the tools and parts contained in the Syringe Repair Kit. In the event of air or water leakage from the syringe, take the following action according to the point of leakage.

1. Leakage around the button or tip can be repaired by installing a new button assembly.
    a. Using a paper clip or similar object, push the retainer pin completely out of the syringe head and remove the faulty button assembly.
    b. Apply a light coating of lubricant around the outside of the o-ring on the new button assembly, then install the new button.
    c. While firmly holding down both buttons reinsert the retainer pin. If you do not hold the buttons down, you risk damaging the o-ring or brass spool.
2. Air leakage around the syringe tip nut is repaired by replacing O-rings.
    a. Loosen the syringe tip nut and remove the tip.
    b. Remove the nut. Note that there is an O-ring retained inside the nut, and another O-ring around the insert.
    c. Use a pointed instrument to remove the O-ring. Apply a light coating of Silicone Lubricant to the new O-rings then carefully install them. Be sure the sleeve is properly seated in the nut before installing the O-ring.
    d. Reinstall the nut, but do not tighten it. Install the syringe tip, then tighten the nut until it is just snug.
3. Leakage between the air and water passages will cause a momentary spray of water from the syringe tip when the air button is pressed. Be sure the tip is pushed all the way into its seat. If it is, the problem is a defective O-ring in the insert.
    a. Remove the tip and nut, as explained in Steps 2a and 2b above.
    b. Use a 5/32-inch hex wrench to remove the insert from the syringe head.
    c. Use a pointed instrument to remove the O-ring from the insert. Apply a light coating of Silicone Lubricant to the new O-ring, then install it in the seat.
    d. Reinstall the insert in the syringe head, and tighten it firmly with the hex wrench.
    e. Install the syringe nut and tip as explained in Step 2d.
4. Leakage from the syringe handle can be repaired by replacing the O-rings on the connector tubes.
    a. Flip the water pressure toggle OFF and disconnect the air supply and press both syringe buttons to relieve pressure from the system.
    b. Unscrew the syringe handle.
    c. Use a pointed instrument to remove the O-rings. Apply a light coating of Silicone Lubricant to the new O-rings, then install them on the connector lines.
    d. Reinstall the connector tubes in the terminal, and reinstall the syringe handle. (Ill. 20)



ILL. 20

SYRINGE
336I101

1	DUAL SYRINGE HEAD	336I101-001
2	DELLA HANDLE	002
3	TERMINAL PLUG	003
4	TUBE	004
5	BARB	005
6	WASHER	006
7	O RING	007
8	BARBS	008
9	WASHER	009
10	O RING	010
11	ADAPTER	011
12	O RING	012
13	SLEEVE	013
14	TIP NUT	014
15	STANDARD TIP	015
16	O RING	016
17	O RING	017
18	O RING	018
19	LOVT BODY	019
20	SPRING	020
21	O RING	021
22	STEM DUAL	022

(SEE ILL. 20)

AIR VACUUM SYSTEM

GENERAL

The Air Vacuum System provides assistant's instrumentation for dental operatiories that are not equipped with central vacuum. The basic system includes a HVE Oral Evacuator and a Saliva Ejector.

HVE ORAL EVACUATOR

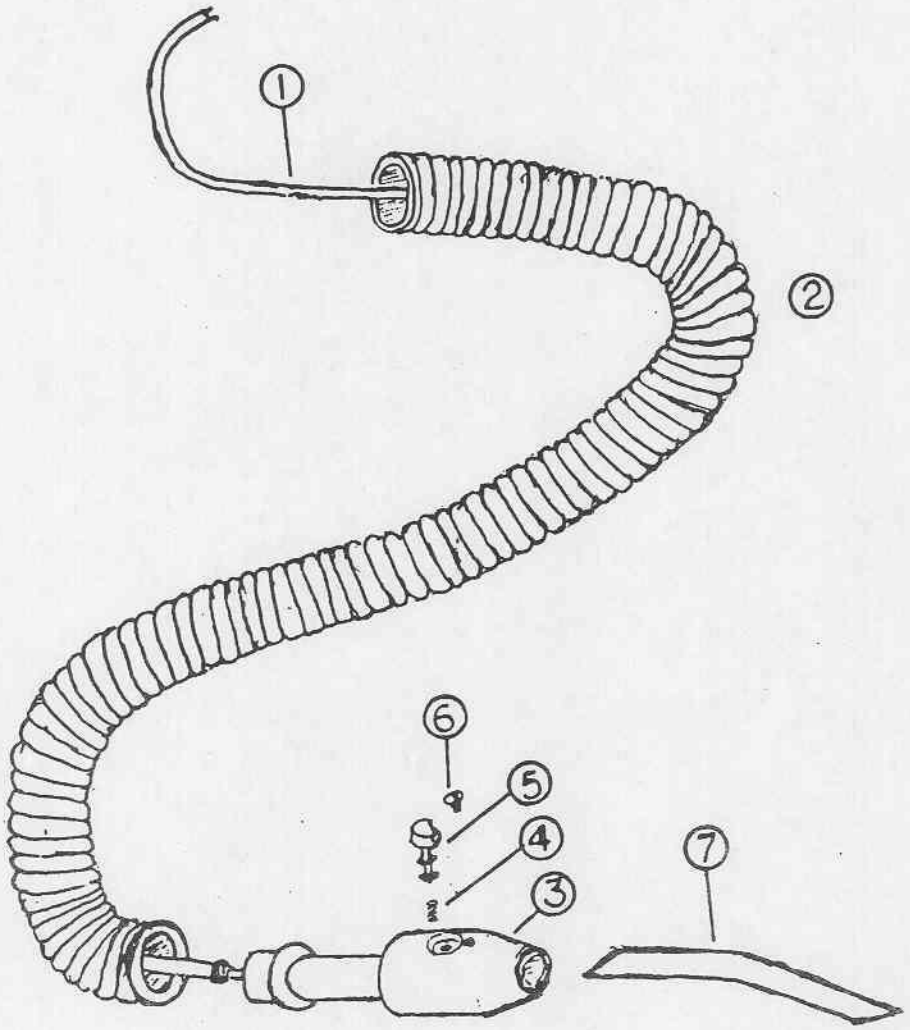
Button Replacement-- If air leakage develops around the HV Oral Evacuator Button, install a new button assembly. The HV Button Kit, in the accessory kit contains the required O-rings.
Remove the HV retainer screw, then pull the button from the HV Oral Evacuator. Us a tool to remove the spring. Install the spring and button, and secure them with the retainer screw. (Ill. 21)

Air Tube Replacement--The air supply tube for the HV Oral Evacuator is inside the flexible drain tube. If the tube becomes crimped or develops a leak, install a new one as follows.:

1. Turn off the air supply to the Unit.
2. Separate the flexible drain tube from the HV Oral Evacuator handpiece and, at the other end, from the canister.
3. Disconnect the air supply tubing from the HVE handpiece and the flow valve.
4. Feed the new air supply tube through the flexible drain tube and feed into the canister.
5. Connect one end of the flexible drain tube to the canister.
6. Connect the air supply tube to the air inlet of the HVE handpiece.
7. Connect flexible drain tube to the handpiece.
8. Feed air supply tube through the small hole in the ell on top of the canister and attach to the flow valve.

AIR VACUUM SYSTEM

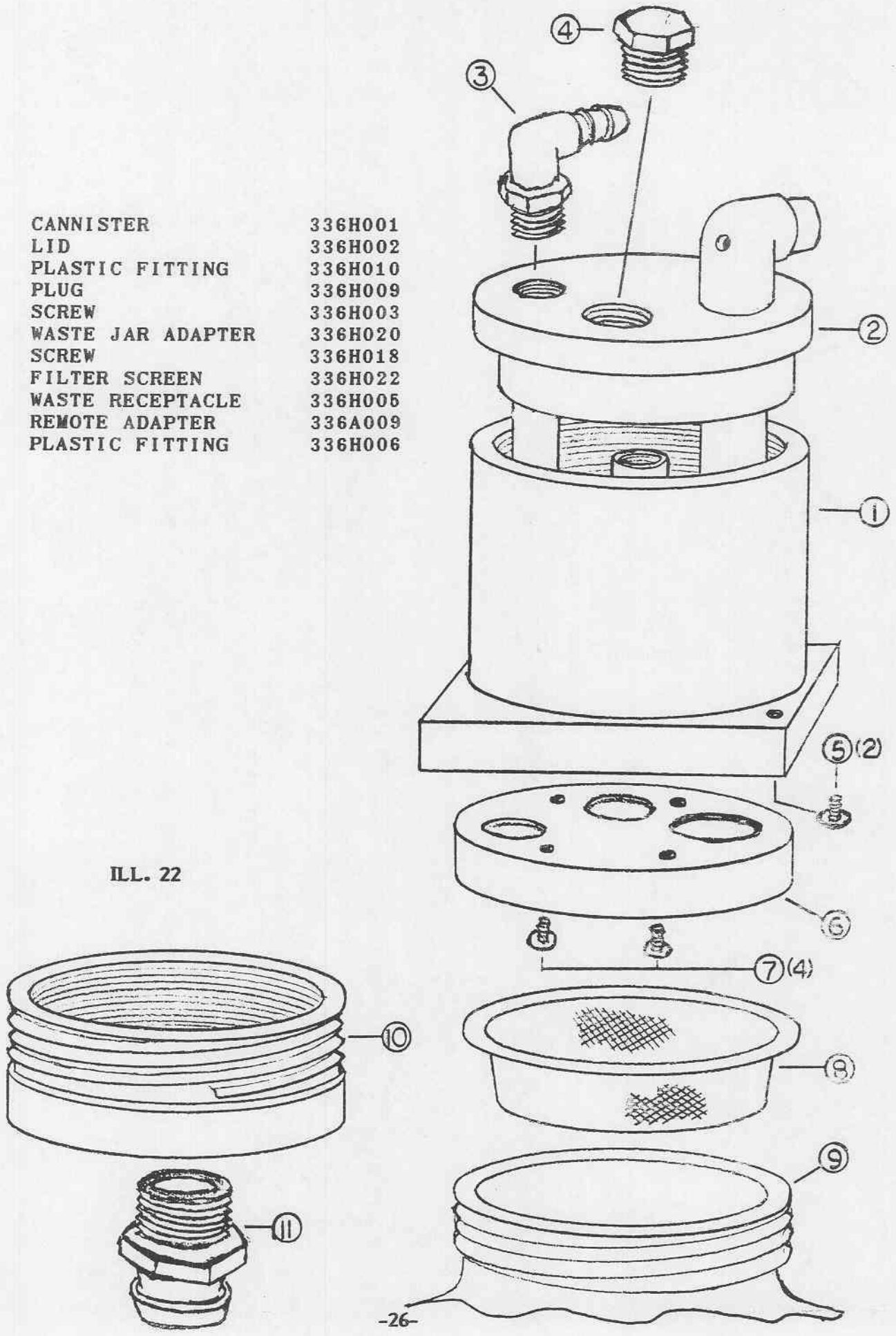
1	AIR SUPPLY TUBE	336T009
2	FLEXIBLE DRAIN TUBE	336H011
3	HANDPIECE BODY	336H013
4	SPRING	336H013-001
5	BUTTON	336H019
6	SCREW	336H015
7	TIP	336H016



ILL. 21

MUFFLER COLLECTOR

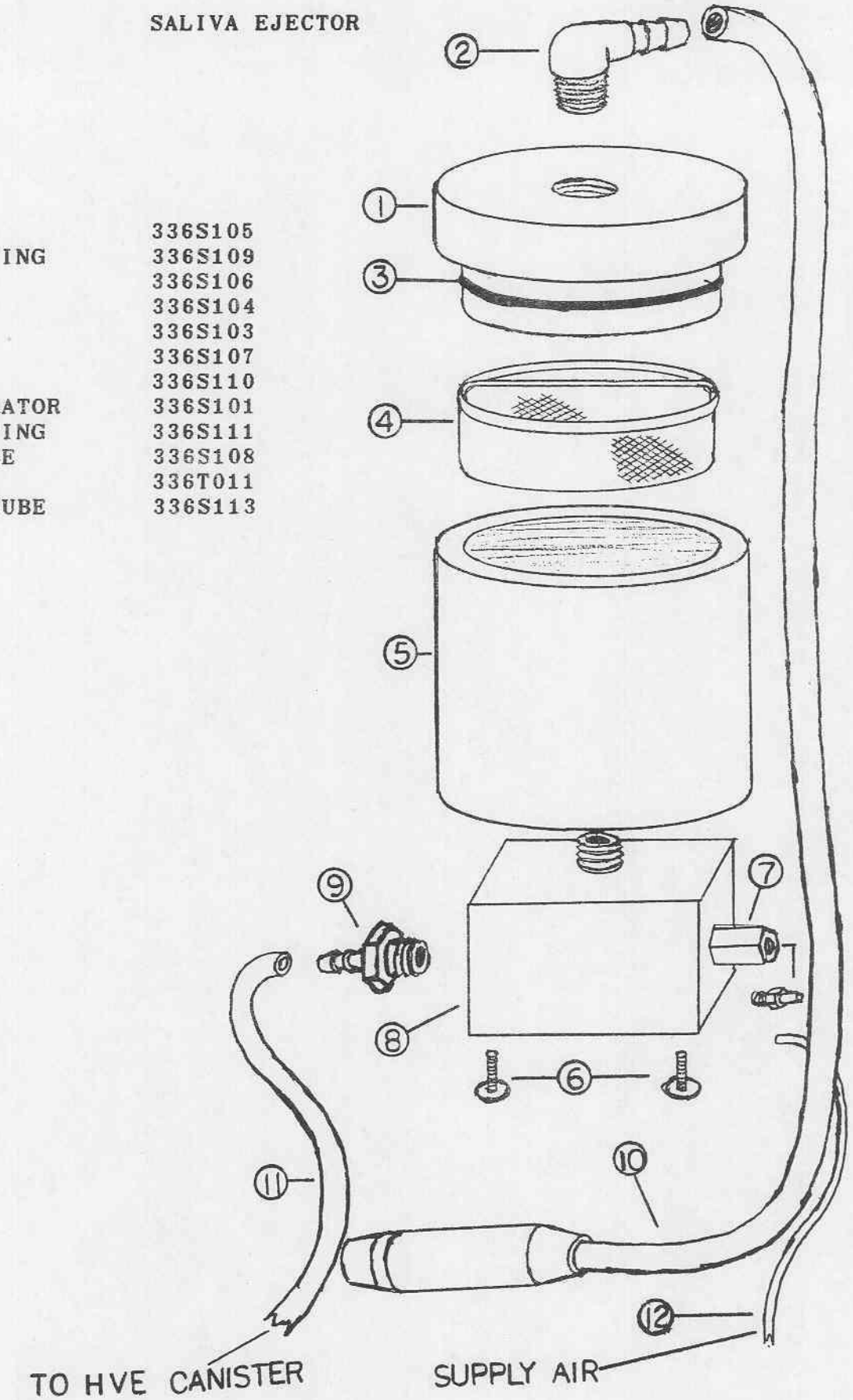
1	CANNISTER	336H001
2	LID	336H002
3	PLASTIC FITTING	336H010
4	PLUG	336H009
5	SCREW	336H003
6	WASTE JAR ADAPTER	336H020
7	SCREW	336H018
8	FILTER SCREEN	336H022
9	WASTE RECEPTACLE	336H005
10	REMOTE ADAPTER	336A009
11	PLASTIC FITTING	336H006



ILL. 22

SALIVA EJECTOR

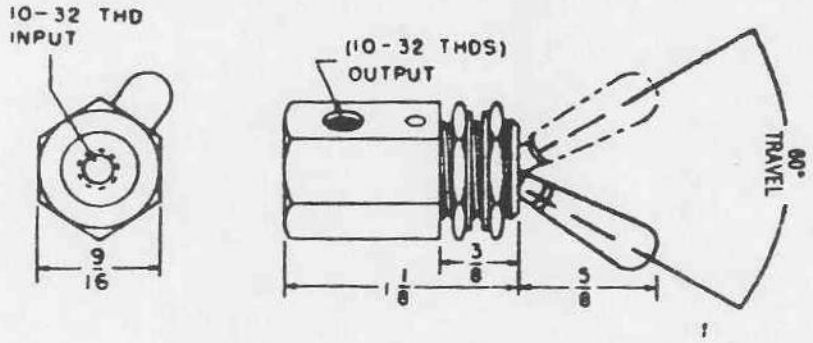
1	LID	336S105
2	PLASTIC FITTING	336S109
3	O RING	336S106
4	BASKET	336S104
5	CANISTER	336S103
6	SCREWS	336S107
7	VENTURA	336S110
8	VACUUM GENERATOR	336S101
9	PLASTIC FITTING	336S111
10	TIP WITH TUBE	336S108
11	SALIVA TUBE	336T011
12	AIR SUPPLY TUBE	336S113



ILL.23

TOGGLE VALVE
336V002

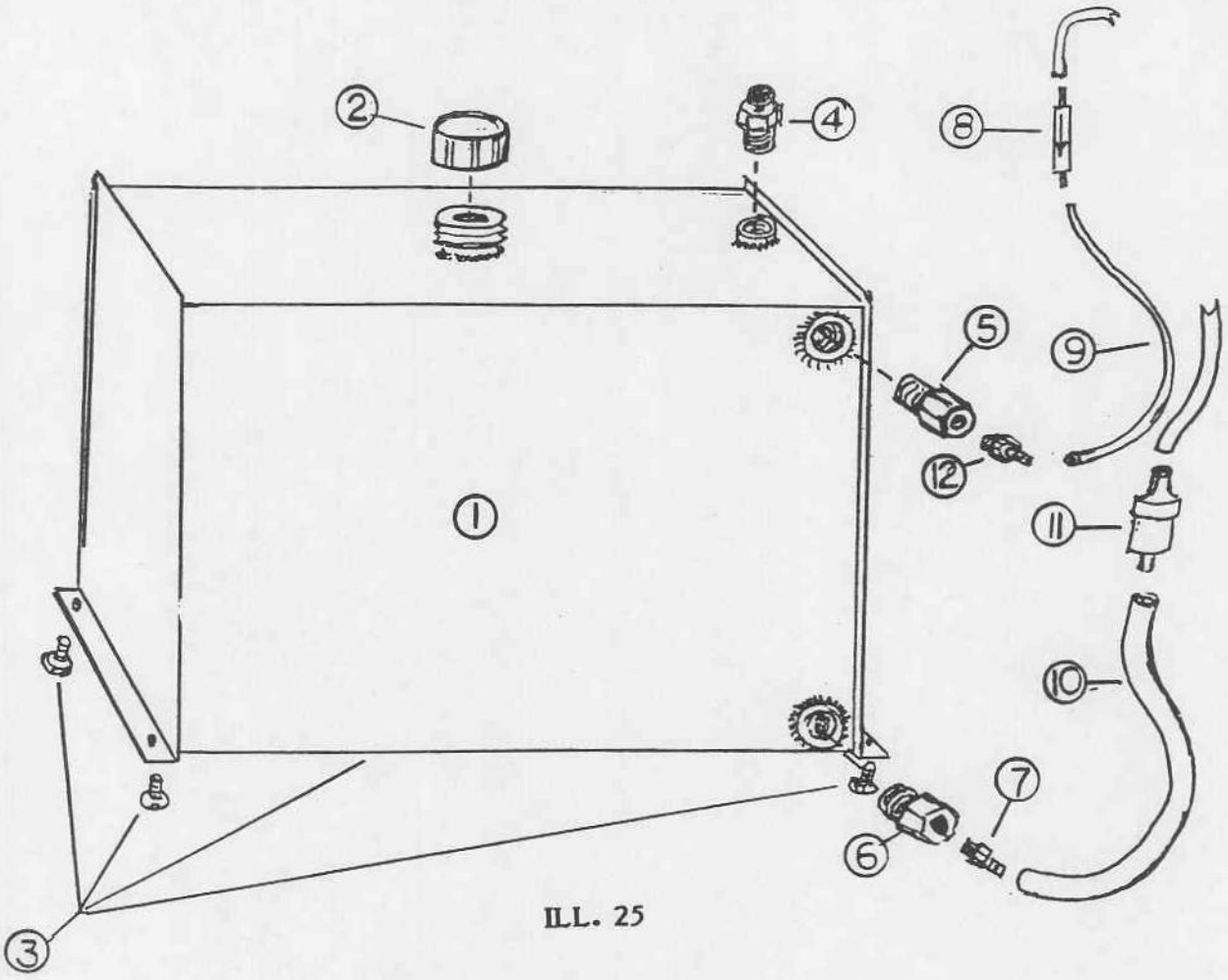
The Illustration shows the toggle valve used in the unit to pressurize the water tank and water coolant. The valve is factory sealed and should be replaced if defective.



ILL. 24

WATER TANK

1	TANK	336W001
2	GHT CAP	336W004
3	SCREWS	336W006
4	VENT VALVE	336W005
5	BUSHING	336F007
6	BUSHING	336F007
7	BARB	336F003
8	CHECK VALVE	336V005
9	TUBE AIR SUPPLY	336T001-001
10	WATER TUBE	336T004-001
11	FILTER	336I003
12	BARB	336F003



ILL. 25

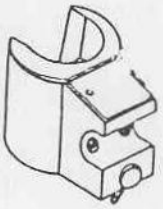
Defiance three-way (exhausting) micro-valve is used in the automatic handpiece holders. While it is normally considered a consumable item, the micro-valve can be serviced by removing it from its actuator and extracting the stem and spring.

3361201-006

3361201

TROUBLESHOOTING

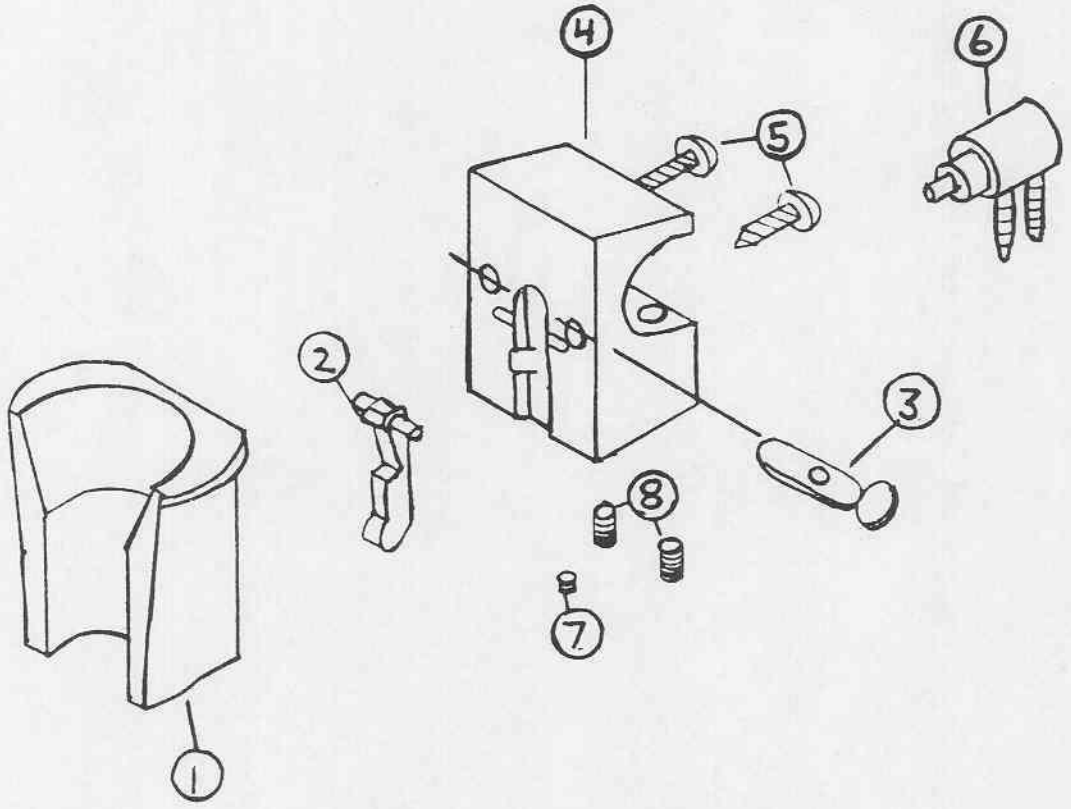
ILL. 26



SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION	
			IF TEST IS NORMAL	IF TEST IS ABNORMAL
Audible leakage when the valve is OFF.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw in the mount, and move the Micro-Valve out slightly while listening for continued leakage.	If the leaking stops, tighten the set screw to lock the valve in position.	If the leaking continues, proceed with the next step.
	Inlet seal does not fully close.	Turn the Micro-Valve ON, and listen for continued leakage.	If the leaking continues, look for a loose connection on the inlet barb.	If the leaking stops, inspect the inlet seal area. Replace any defective parts. Re-assemble and test the valve.
Leakage from the valve when it is turned ON.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw and push the Micro-Valve **further** into its mount, while listening for continued leakage.	If the leaking stops, tighten the set screw to lock the valve in place.	If the leaking continues proceed with the next step.
	Exhaust seal does not fully close.	With a hemostat, clamp off the tube connected to the inlet barb, then disassemble the valve. Inspect all parts in the exhaust seal area for defects or debris.	If no defects are found, re-assemble and test the valve.	Replace any defective parts. Re-assemble and test the valve.
Valve does not exhaust when it is turned OFF.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw in the mount, and move the Micro-Valve out slightly while listening or a short burst of air exhausting from the valve.	If the valve exhausts, tighten the set screw to lock the valve in position.	If the valve still does not exhaust, proceed with the next step.
	The exhaust seal O-ring is installed in the wrong groove on the stem. (This applies only to stems manufactured after mid-1978).	With a hemostat, clamp off the tube connected to the inlet barb, then disassemble the valve. Of the two closely-spaced grooves in the exhaust end of the stem, the exhaust seal O-ring belongs in the one closer to the end. The other groove should be empty.	If the O-ring is correctly installed, look for debris in the exhaust seal area. Re-assemble and test the valve.	If the O-ring is in the wrong groove, move it to the correct one. Re-assemble and test the unit.
No air flows through the valve when it is turned ON.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw, and push the Micro-Valve further into the mount. Tighten the set screw and test the valve.	If it works properly, no further action is required.	If the valve still does not work, proceed with the next step.
	No air pressure at the valve inlet.	Disconnect the tube from the inlet barb and check for air coming from the tube.	If air is present, proceed with the next step.	If no air comes from the tube, look for a problem upstream from the valve.
	Debris inside the Micro-Valve.	Clamp off the inlet tube with a hemostat, then disassemble the valve and inspect for defects or debris.	If no debris or defects are noted, look for a blockage in the tubing on the downstream side of the valve.	Clean all parts and lubricate the stem and O-rings. Re-assemble and test the valve.

PILOT VALVE & HOLDER ASSEMBLY
3361201

1	HOLDER	3361201-001
2	ACTIVATOR	002
3	LEVER	003
4	HOLDER BODY	004
5	SCREW	005
6	PILOT VALVE	006
7	SET SCREW	007
8	SET SCREW	008



ILL. 27

CHIP BLOWER VALVE
(TWO-WAY MICRO-VALVE)

DISCRIPTION The chip blower valve assembly on the foot control consists of a two-way (non-exhausting) micro-valve mounted in a button operated actuator. This valve is normally considered to be a consumable item, however it can be serviced by removing it from its actuator and extracting the stem and spring.

Chip Blower Valve (Two-Way Micro-Valve) Troubleshooting

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION	
			IF TEST IS NORMAL	IF TEST IS ABNORMAL
Air leaks past the valve when it is turned OFF.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw in the mount, and move the Micro-Valve out slightly, while listening for continued leakage.	If the leaking stops, tighten the set screw and lock the valve in position.	If the leaking continues, proceed with the next step.
	Inlet seal does not fully close.	Turn the Micro-Valve ON, and listen for continued leakage.	If the leaking continues, look for a loose connection on the inlet barb.	If the leaking stops, inspect the inlet seal area. Replace any defective parts. Re-assemble and test the valve.
Air leakage around the stem when the valve is ON, and/or downstream pressure exhausts when the valve is turned OFF.	Leakage past the stem seal.	Use a hemostat to clamp off the tube connected to the inlet barb, then disassemble the valve. Inspect all internal parts and surfaces for debris or defects.	If no defects are observed, proceed with the next step.	Replace any defective parts. Re-assemble and test the valve.
	The stem seal O-ring is installed in the wrong groove.	Disassemble the Micro-Valve and inspect the stem. Of the two closely-spaced grooves in the outlet end of the stem, the O-ring belongs in the one further from the end. The groove closer to the end should be empty.	If the O-ring is correctly installed, look for debris in the valve. Clean and lubricate the parts. Re-assemble and test the valve.	If the O-ring is in the wrong groove, move it to the correct one. Re-assemble and test the valve.
No air flows through the valve when it is turned ON.	Improper positioning of the Micro-Valve in its mount.	Loosen the set screw, and push the Micro-Valve further into the mount. Tighten the set screw and test the valve.	If the valve works properly, no further action is required.	If the valve still does not work, proceed with the next step.
	No air pressure at the valve inlet.	Disconnect the tube from the inlet barb and check for air coming from the tube.	If air is present, proceed with the next step.	If no air comes from the tube, look for a problem upstream from the valve.
	Debris inside the Micro-Valve.	Clamp off the inlet tube with a hemostat, then disassemble the valve and inspect for debris or defects.	If no debris or defects are noted, look for a blockage in the tubing on the downstream side of the valve.	Clean all parts and lubricate the stem and O-rings, then re-assemble and test the valve.

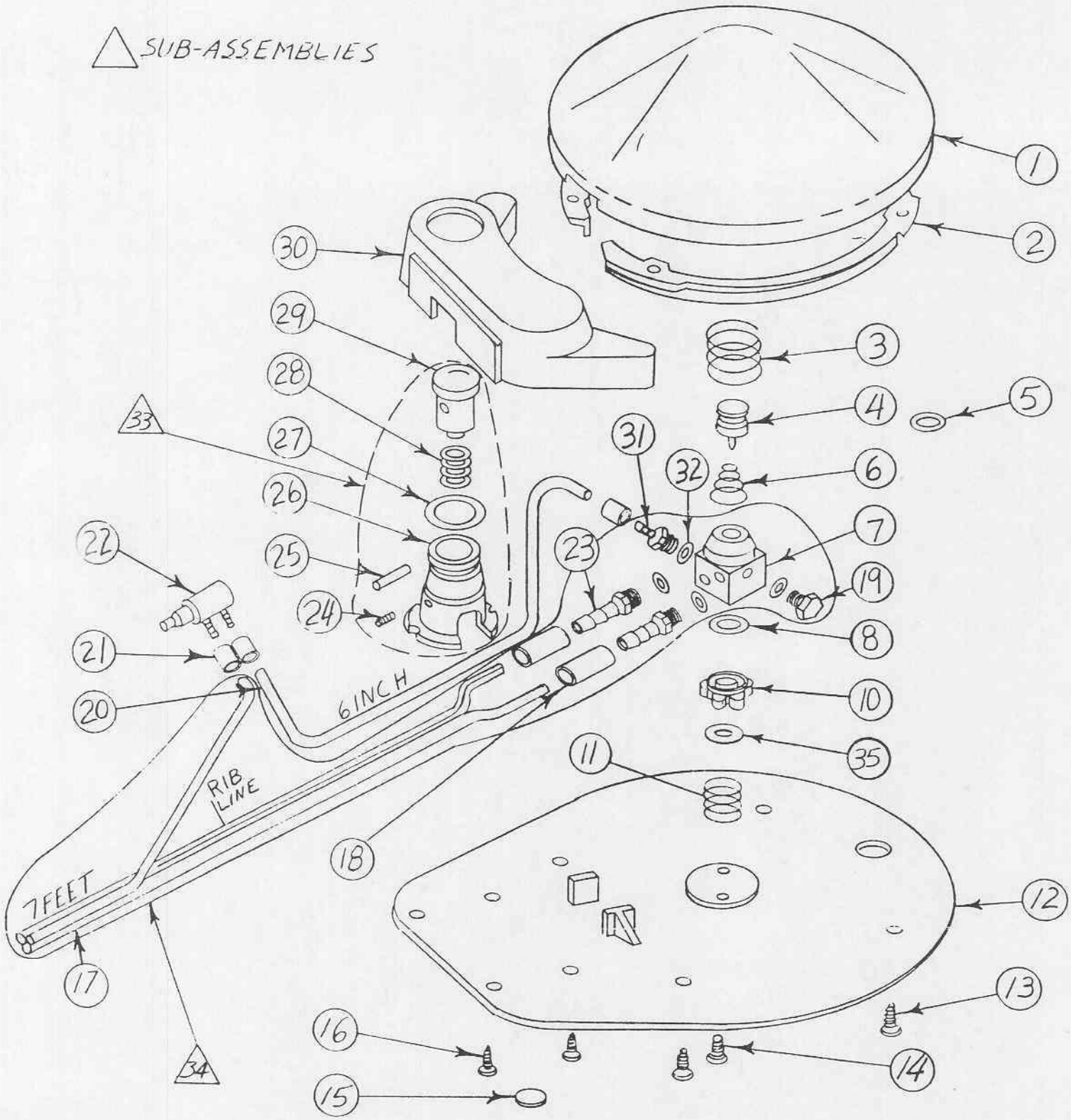
ILL. 28

FOOT CONTROL VALVE TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION	
			IF TEST IS NORMAL	IF TEST IS ABNORMAL
Audible leakage while the Foot Control is not being used.	Loose mounting screws.	Turn the Foot Control face down and tighten the two phillips-head screws at the center of the baseplate.	If the leakage stops, no further action is required.	If the leakage does not stop, proceed with the next step.
	Loose connection.	Note "WARNING" in the description heading. Remove the Foot Control cover and use a soap solution, if necessary, to located the source of the leakage. For leakage from the Signal Relay refer to the instructions covering the Signal Relay.	If the air is leaking around the barb connection, tighten the barb and re-test the valve.	If the air is leaking from the exhaust vent or around the bottom of the valve body, proceed with the next step.
	Defective O-rings or sealing surface.	Turn the unit OFF and bleed the air pressure, then disassemble the Foot Control. Inspect the O-rings and sealing surfaces for defects and debris.	If no defects are noted, carefully clean and lubricate the parts. Re-assemble and test the valve.	Replace any defective parts. Carefully clean and lubricate all parts. Re-assemble and test the valve.
Inadequate air flow from the Foot Control.	Inadequate air flow to the Foot Control.	Refer to the instructions for Regulators, and conduct the tests for "System pressure drops when the system is in use, then builds back up when it is not being used."	If these tests indicate that there is adequate air in the system, proceed with the next step.	If any of the tests indicates a problem in the air supply to the Foot Control, take the corrective action recommended.
	Pinched tubing going to or from the Foot Control.	Inspect the Foot Control tubing for crimps or restrictions.	If no problem is found, proceed with the next step.	If the tubing is crimped, install a new one, assemble and test the unit.
	Obstruction at the inlet or outlet.	Note "WARNING" in the description heading. With the cover removed, depress the piston and check for adequate air flow.	If no defects are noted, carefully clean and lubricate the parts. Re-assemble and test the valve.	Replace any defective parts. Carefully clean and lubricate all parts. Re-assemble and test the valve.
Foot Control is sluggish.	Sticking stem.	Note "WARNING" in the description heading. Remove the valve body from the base. Remove and inspect the O-rings and spacers for debris or defective parts.	If it works easily and smoothly, check for a weak or improperly installed spring.	If there is any sticking or binding, remove the stem, spacers, and O-rings. Replace any defective parts. Carefully clean and lubricate all parts. Re-assemble and test the valve.

ILL. 29

△ SUB-ASSEMBLIES



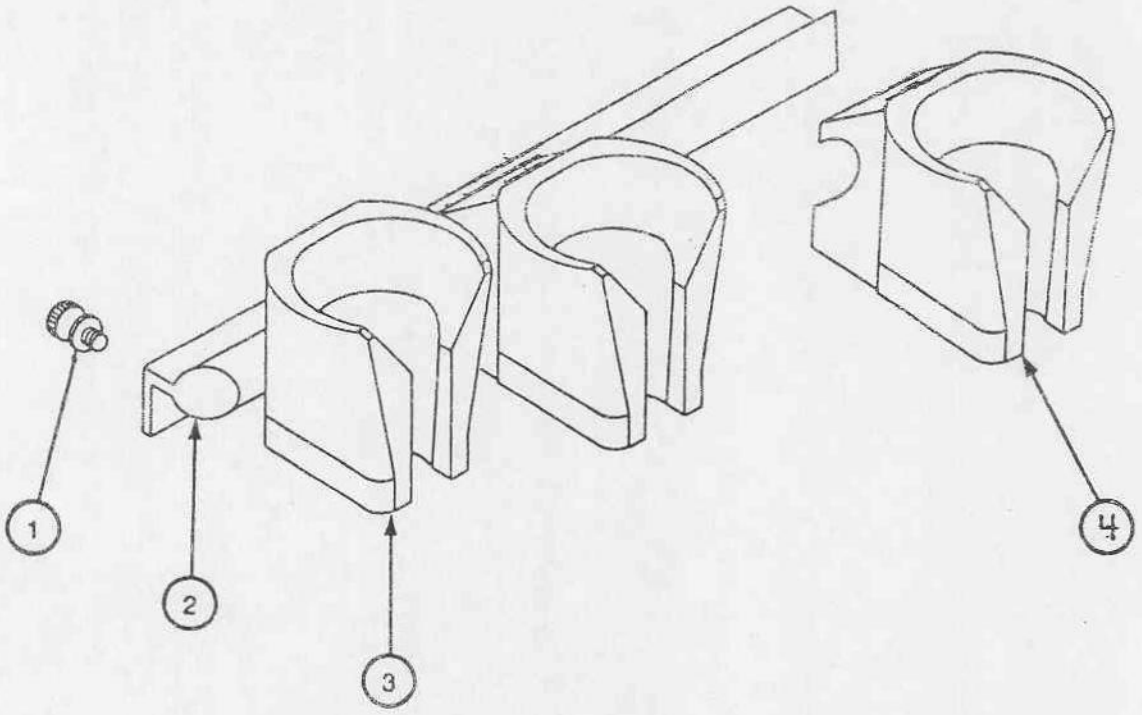
FOOT CONTROL
336V008

1	COVER PLATE	336V008-001
2	INNER RING	002
3	LARGE SPRING	003
4	PISTON	004
5	PISTON O RING	005
6	SPRING	006
7	VALVE BODY	007
8	BODY O RING	008
10	POPPET MOLDED	010
11	SPRING	011
12	BASE PLATE	012
13	6-1/2 SCREWS	013
14	6-32X1/4 SCREW	014
15	ROUND BUMB	015
16	4 X 1/2 SCREW	016
17	FC-3H-GREY-U 7FT	017
18	1/4" SLEEVE CLAMP	018
19	10-32 HEX PLUG	019
20	1 HOLE BLACK 1/8	020
21	SLEEVE CLAMP	021
22	PILOT VALVE	022
23	1/8 BARB 10-32	023
24	6-32X1/4 SET SCREW	024
25	1/8X5/8 DOWEL PIN	025
26	VALVE TOWER	026
27	O-RING	027
28	SPRING	028
29	CHIP BLOWER BUTTON	029
30	SHROUD	030
31	1/16 BARB 10-32	031
32	NYLON WASHER	032
33	CHIP BLOWER TOWER ASSY	033
34	CHIP BLOWER FOOT	034
35	WASHER	035

(SEE ILL. 30)

HANDPIECE HANGER ASSEMBLY

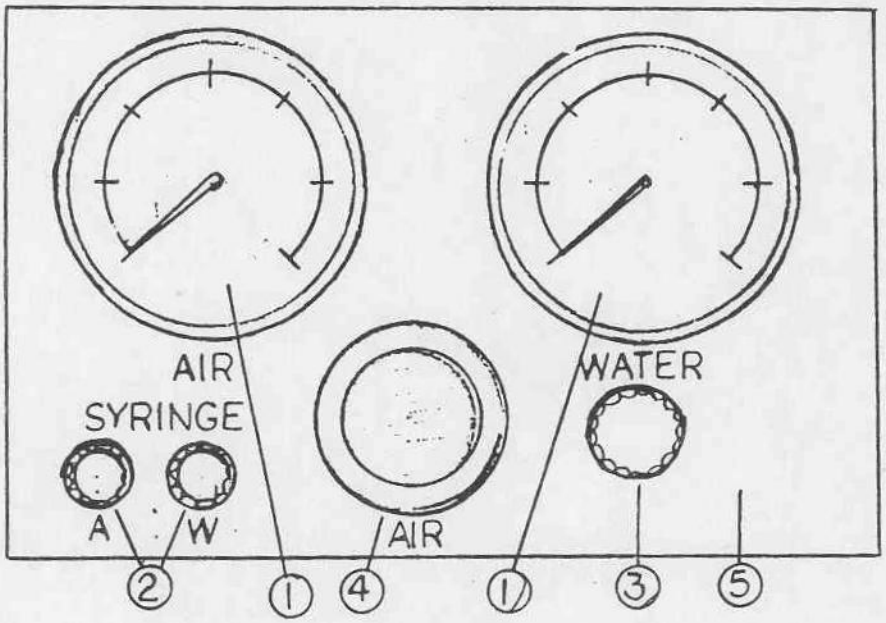
1	SCREW, KNURLED	3361005
2	HOLDER BRACKET	3361206
3	STANDARD HOLDER	3361205
4	AUTO HANDPIECE HLDR	3361201



ILL. 31

INTERNAL PANEL
336C004

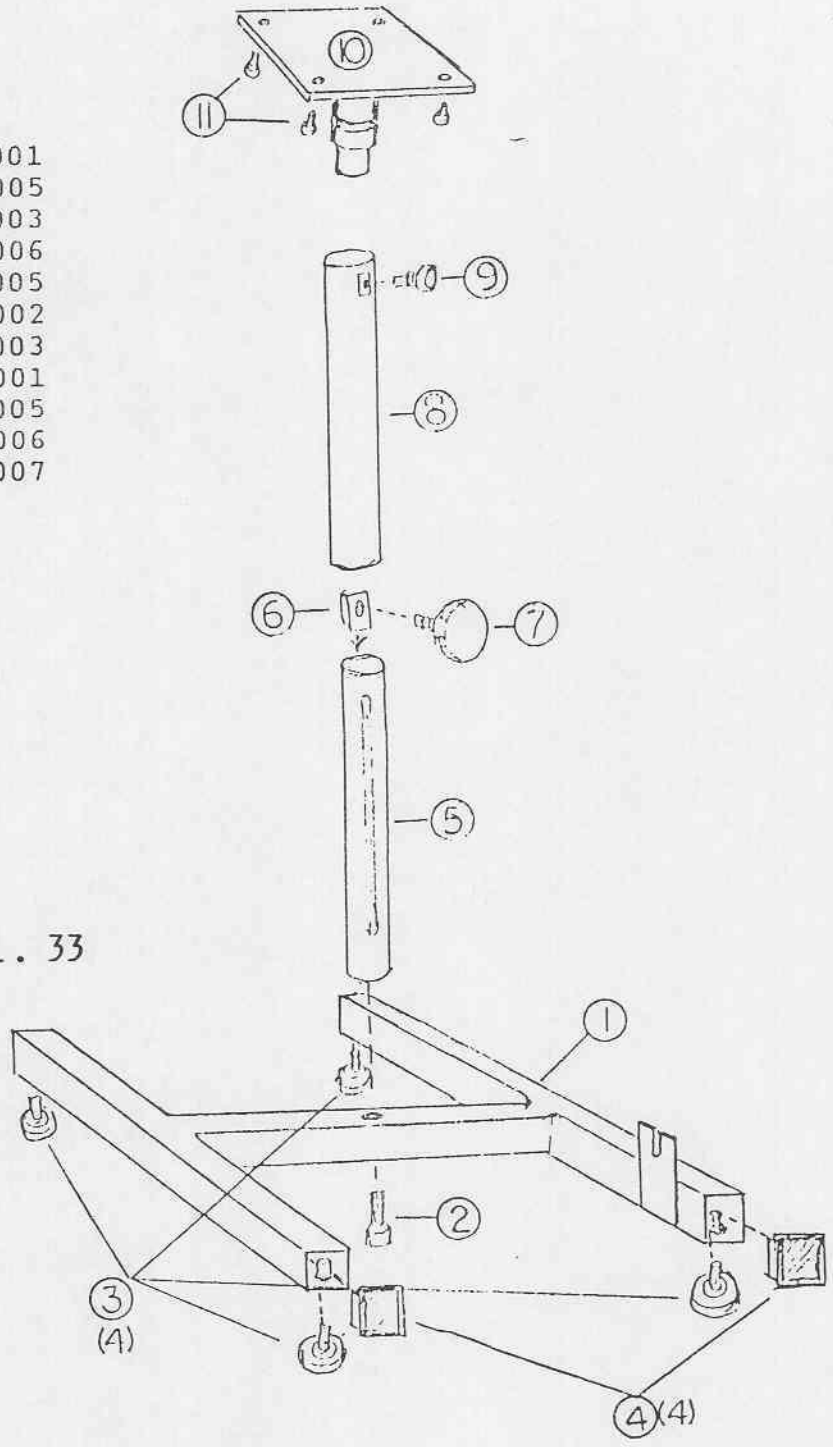
1	GAUGE	336V011
2	FLOW VALVE	336V001
3	WATER REGULATOR	336V006
4	AIR REGULATOR	336V010
5	PANEL	336C004



ILL. 32

STAND

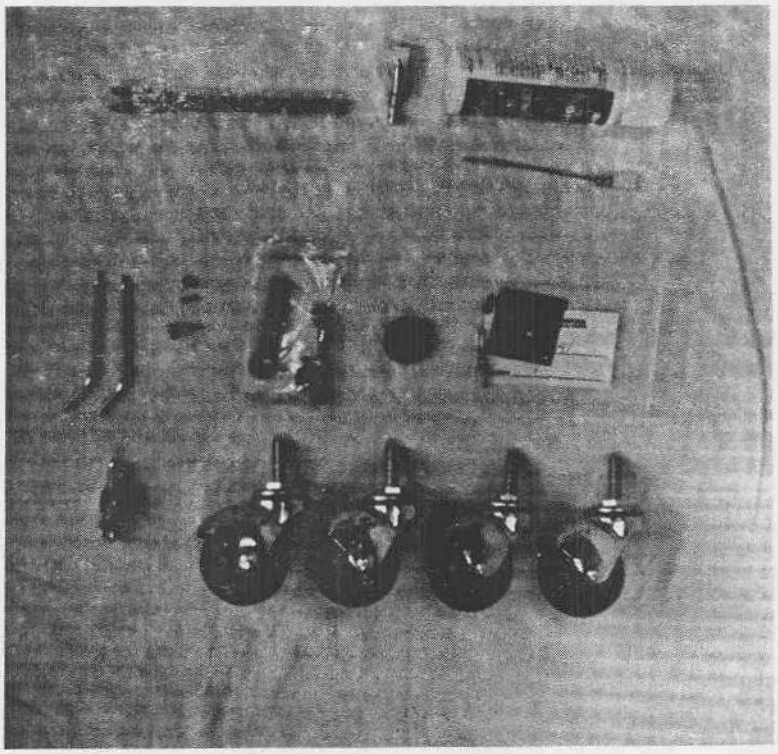
1	BASE	336S001
2	SCREW	336S005
3	ADJUST REST PAD	336S003
4	CUSHION BUMPER	336S006
5	INNER MEMBER	336U005
6	PLASTIC LOCK	336U002
7	KNOB	336U003
8	OUTER MEMBER	336U001
9	THUMBSCREW KNURL	336I005
10	ASSEMBLY PLATE	336U006
11	SCREWS	336U007



ILL. 33

ACCESSORY KIT

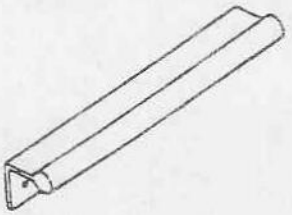
1	QUICK DISCONNECT	336A006
2	SYRINGE TIPS	336A008
3	HVE BUTTON KIT	336A005
4	3-WAY SYRINGE KIT	336A001
5	TUBING TOOL	336A004
6	HANDPIECE LUBRICANT	336A011
7	AIR REGULATOR KIT	336A002
8	CONTROL BLOCK KIT	336A003
9	BALL CASTERS	336S004
10	ALLEN WRENCH	336A010



ILL. 34

TRIPLE HOLDER BRACKET 3361206

MOUNTS ON VERTICAL SURFACE
SATIN FINISHED ANODIZED ALUMINUM
MOUNTING SCREWS



STANDARD HOLDER 3361205

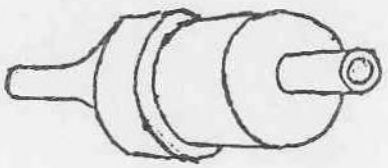
MOUNTS ON HOLDER BRACKETS
10-32 MOUNTING SCREWS
5/8' DIAMETER
HANDPIECE WITH STANDARD NUT
SALIVA EJECTOR SYRINGE

HVE HOLDER 3361202

MOUNTS ON HOLDER BRACKET
10-32 MOUNTING SCREWS
HOLDS VACUUM HANDPIECE BODY

WATER FILTER
3361003

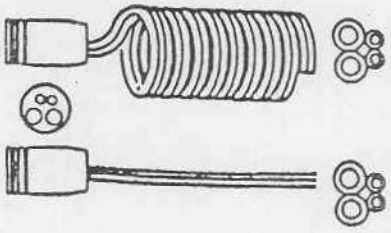
NON REPAIRABLE



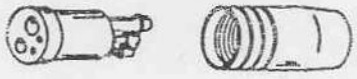
ILL. 35

ALL HANDPIECE TUBING, CONNECTOR AND NUT
ASSEMBLIES ARE 7-FOOT (214 CM) LENGTH

MIDWEST PATTERN QUAD TUBING
FOR DRIVE AIR EXHAUST AIR AND WATER COOLANT
*MIDWEST STYLE CONNECTOR AND NUT ATTACHED
*COILED BLACK 336I105



MIDWEST STYLE 4-HOLE
*CONNECTS TO ONE, TWO, THREE OR FOUR-HOLE TUBING
*CONNECTOR AND NUT 336I106



HANDPIECE NUT
MIDWEST STYLE (NUT ONLY) 336I107

CONNECTOR
MIDWEST STYLE (CONNECTOR ONLY) 336I108

ILL. 36

ACCESSORY KIT	
3 WAY REPAIR	336A001
AIR REGULATOR KIT	336A002
CONTROL BLOCK KIT	336A003
TUBING TOOL	336A004
HVE BUTTON KIT	336A005
QUICK-DISCONNECT	336A006
WRENCH	336A007
SYRINGE TIP	336A008
REMOTE ADAPTER	336A009
ALLEN WRENCH	336A010
HANDPIECE LUBRICANT	336A011

STORAGE CASE	
CASE	336C101
NAME PLATE	336C102
RIVET	336C103

FITTINGS	
TEE 10-32	336F001
BARB 1/16	336F002
BARB 1/8	336F003
CLAMP 1/8	336F004
SLEEVE 1/4	336F005
ELL	336F006
BUSHING	336F007
BUSHING	336F008
BUSHING	336F009
QUICK DISCONNECT	336F012
FITTING	336F014

TUBING	
YELLOW 1/8 X 1/16	336T001
BLUE 1/8 X 1/16	336T002
YELLOW 1/4 X 1/8	336T003
BLUE 1/4 X 1/8	336T004
BLUE 1/4 X .159	336T005
BLACK 3/8 X 1/4	336T006
GRAY 1/8 X 1/16	336T007
NATURAL 3/8 X 1/4	336T008
BLACK 1/8 X 3/16	336T009
10' UTILITY HOSE	336T010
GRAY 3/8X1/4	336T011

HV EVACUATOR	
CANISTER	336H001
LID	336H002
SCREWS	336H003
NUTS, WING	336H004
WASTE RECEPTACLE	336H005
PLASTIC FITTING	336H006
PLASTIC SCREEN	336H007
ALUMINUM STRAP	336H008
PLUG	336H009
PLASTIC FITTINGS	336H010
HOSE	336H011
CUSPIDOR	336H012
HANDPIECE BODY	336H013
"O" RING	336H014
SCREW	336H015
HVE TIPS	336H016
STORAGE CAPS	336H017
SCREWS	336H018
BUTTON	336H019
WASTE JAR ADAPTER	336H020
PLASTIC PLUG	336H021
FILTER SCREEN	336H022

VALVES	
FLOW	336V001
TOGGLE	336V002
VALVE	336V003
ACTUATOR	336V004
CHECK	336V005
WATER REGULATOR	336V006
PUSH-BUTTON	336V007
FOOT	336V008
CONTROL BLOCK	336V009
AIR REGULATOR	336V010
PRESSURE GUAGE	336V011

INTERNAL PARTS	
AIR MANIFOLD	336I001
COOLANT MANIFOLD	336I002
WATER FILTER	336I003
SCREWS W/NUT	336I004
THUMBSCREW KNURLED	336I005

INSTRUMENT HOLDER	
AUTO	336I201
HVE	336I202
SALIVA	336I203
3 WAY	336I204
STANDARD	336I205
BRACKET	336I206

STAND	
BASE	336S001
ADJUST REST PAD	336S003
BALL CASTER	336S004
SCREW	336S005
CUSHIONING BUMPER	336S006

WATER TANK	
TANK	336W001
GHT FITTING	336W004
VENT VALVE	336W005
SCREWS	3362006
RUBBER WASHER	336W007
CONTROL CABINET	
CONTROL CABINET	336C001
WIRE HANDLES	336C002
SCREWS	336C003
INTERNAL PANEL	336C004
NAME PLATE	336C005
SCREWS W/NUTS	336C006
RIVETS	336C007
SALIVA EVACUATOR	
VAC-GEN	336S101
1/8 NIPPLE	336S102
CANISTER	336S103
BASKET	336S104
LID	336S105
"O" RING	336S106
SCREWS	336S107
TIP WITH TUBING	336S108
PLASTIC FITTING	336S109
VENTURA	336S110
PLASTIC FITTING	336S111
AIR SUPPLY	336S113
INSTRUMENTS	
3-WAY SYRINGE	336I101
HI-SPEED HANDPIECE	336I102
MOTOR	336I103
NOSE CONE	336I104
HANDPIECE TUBE	336I105
CONNECTOR	336I106
HANDPIECE NUT	336I107
CONNECTOR	336I108
UPRIGHT	
OUTER MEMBER	336U001
PLASTIC LOCK	336U002
KNOB	336U003
INNER MEMBER	336U005
ASSEMBLY PLATE	336U006
SCREWS	336U007